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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 27 NOVEMBER, 1944 NUMBER 11

DEEP-CHAMBER GLAUCOMA DUE TO THE FORMATION OF A CUTICULAR PRODUCT IN THE FILTRATION ANGLE

ALGERNON B. REESE, M.D.*
New York 21

In the majority of the cases of primary glaucoma there is a shallow anterior chamber. The pathologic change is posterior to the iris and probably in the ciliary body and/or the vitreous. In a much smaller number of cases there is a normally deep, or even an abnormally deep, anterior chamber. The pathologic change is in the trabecular region. The lesion is usually referred to as a sclerosis of the trabeculae, and it is concerning the nature of this condition that this paper deals.

ANATOMY

The anterior chamber, as well as the interstices of the trabeculae at the filtration angle, is lined with endothelium. This endothelium is capable of producing a cuticular product or glass membrane as exemplified by Descemet's membrane. The endothelium retains its ability to produce the cuticular product throughout life, but does not manifest this potentiality except under certain provocations. For instance, as a sign of senescence, excrescences of Descemet's membrane are frequently produced in the peripheral area (Henle's warts); also, as a senile change, Descemet's membrane may become thicker. The excrescences and the thickening may occur in an aggravated form over the entire membrane and produce the conditions of cornea guttata and dystrophia epithelialis corneae. After injury the endothelium of the cornea will regenerate a new Descemet's membrane. Under certain pathologic provocations the endothelium along the anterior surface of the iris may produce a membrane similar to, and even thicker than, the Descemet's membrane of the cornea (fig. 13).

The corneal endothelium, as well as some of its cuticular product, is continued normally from the cornea to cover the interstices of the trabeculae (fig. 1). The structure of a trabecula, therefore, is a central collagenous fibrous strand around which is the cuticular product as a thin glass membrane, and this, in turn, is covered by the endothelium (fig. 2). Under certain provocations the endothelium, which lines the trabecular spaces and covers the inner surface of the filtration angle, may form its cuticular product, which fills the interspaces and/or forms a Descemet's-like membrane along the inner surface of the angle. The formation of this cuticular product in the filtration angle may obstruct the outflow of aqueous and produce glaucoma. It is this thesis that the author wishes to support.

PATHOLOGY

The pathology is based on the microscopic examination of 26 globes. All of these were thought to belong to the group described in this paper. There were 16

*From the Institute of Ophthalmology of the Presbyterian Hospital, New York. Read at the eightieth meeting of the American Ophthalmological Society, at Hot Springs, Virginia, May 29-31, 1944.

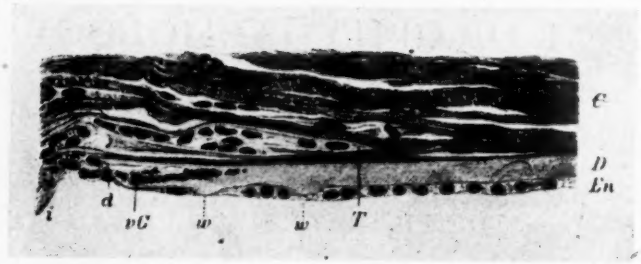

Fig. 1 (Reese). Normal anatomy at the termination of Descemet's membrane and the anterior border of the trabeculae (Salzmann). C, corneal stroma; T, deep anterior extremity of the trabeculae; D, Descemet's membrane; w, warts; d, termination of Descemet's membrane; vG, anterior-border ring; en, endothelium; i, fiber of the uveal trebeculae.

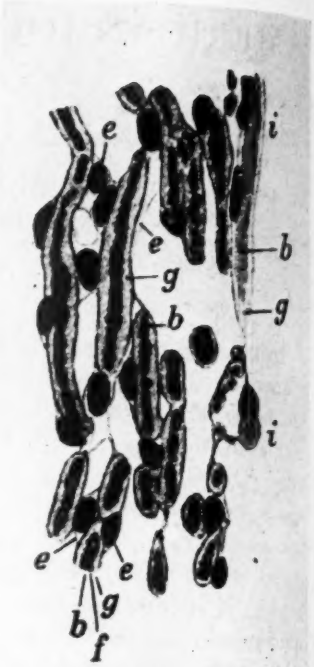

Fig. 2 (Reese). Normal anatomy of the trabeculae (Salzmann): i, uveal trabeculae. The remaining trabeculae belong to the scleral portion and show at: b, collagenous connective tissue; f, elastic fibers; g, glass membrane; e, endothelium.

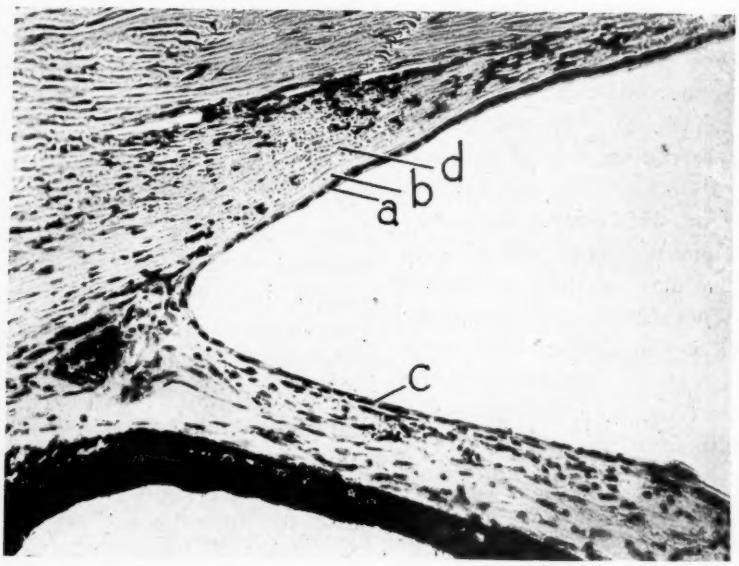

Fig. 3 (Reese). Deep-chamber glaucoma with open angle. Over the inner surface of the trabeculae the endothelial layer is seen (a), and under this a homogeneous glass membrane (b) which is continuous with Descemet's membrane. The endothelium and the glass membrane are continued, but the latter to a less degree, over the surface of the iris (c). The interstices of the trabeculae are decreased in size but still visible (d).

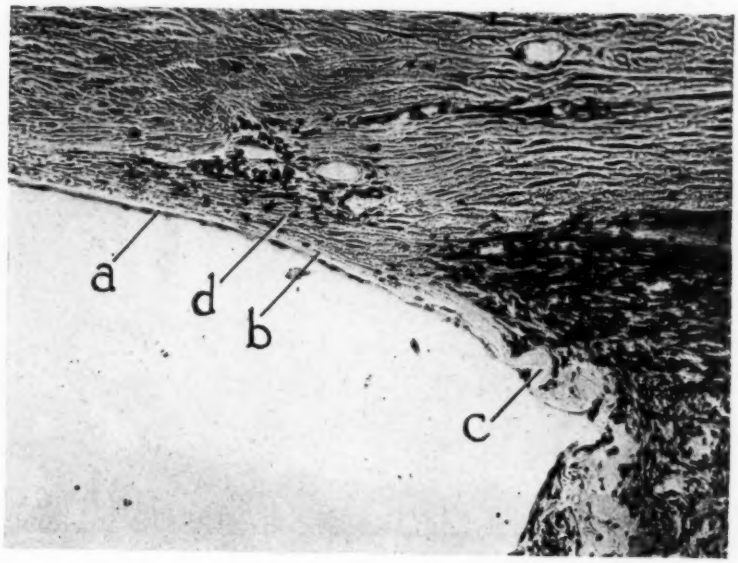

Fig. 4 (Reese). Deep-chamber glaucoma with open angle. Over the inner surface of the trabeculae the endothelial layer is seen (a), and under this a homogeneous glass membrane (b) which is continuous with Descemet's membrane. The glass membrane is particularly thick and also in folds over the inner surface of the ciliary body (c). The trabecular spaces seem somewhat compressed (d).

additional globes also with deep-chamber glaucoma and open filtration angle which did not belong to this group. The glaucoma in these cases was certainly due to impervious trabeculae, and pigment granules in the interstices were a conspicuous feature. They seem to represent instances of glaucoma due to obstruction of the trabeculae from sclerosis, but no effort has been made to determine the underlying pathology except to note that impregnation of the trabeculae with pigment was an outstanding finding. These 16 cases were eliminated.

Even though the glaucoma discussed in this paper begins with an open filtration angle, if increased ocular pressure is present over a sufficiently protracted period, peripheral synechiae will develop (figs. 8, 11, 13). The mere state of in-

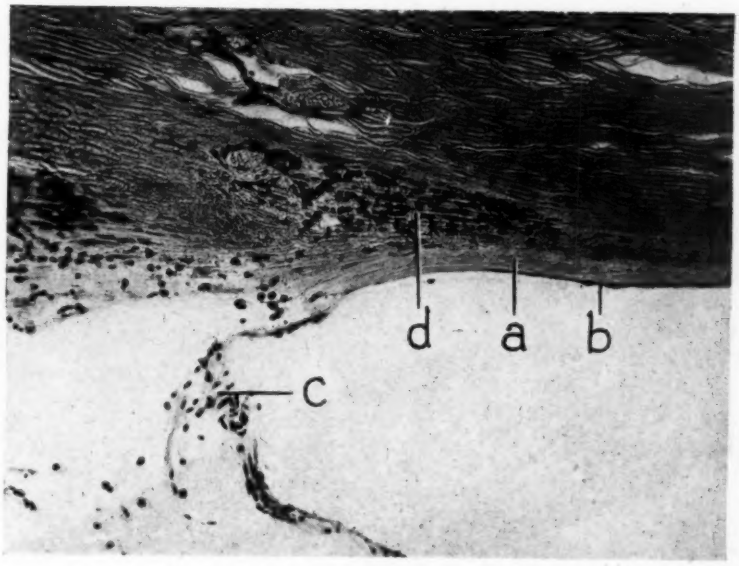

Fig. 5 (Reese). Deep-chamber glaucoma with open angle. The inner surface of the trabeculae is covered with a glass membrane (a) even thicker than Descemet's membrane with which it is continuous. Over the surface of the glass membrane is a thin layer of endothelial cells (b). Extending from the termination of the glass membrane across the angle to the anterior surface of the iris is an iris process (c). The trabecular spaces are collapsed (d).

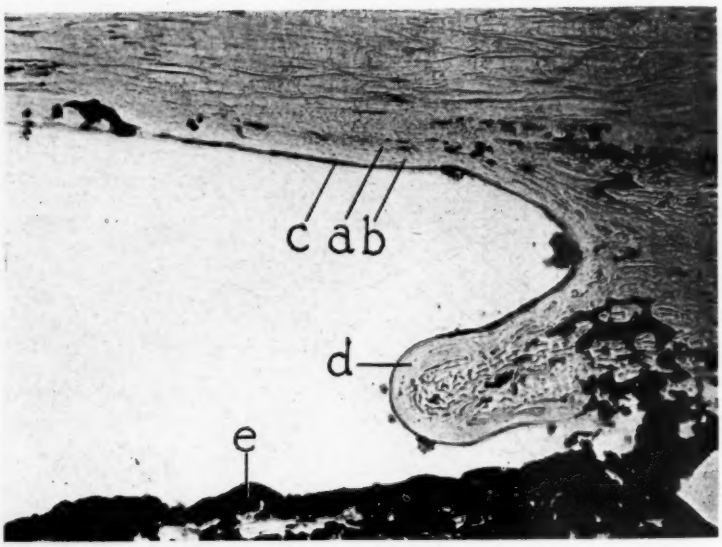

Fig. 6 (Reese). Deep-chamber glaucoma with open angle. The trabecular area is replaced by homogeneous tissue sparse in nuclei (a), and over its surface there is a glass membrane (b) and a layer of endothelium (c) continuous with those of the cornea. The glass membrane and endothelium are also continued over the angle where they are seen as a tall fold (d); e, anterior surface of the iris.

creased ocular pressure *per se,* from any type of glaucoma, tends to produce peripheral synechiae. Therefore, all glaucoma in the late stages, whether it began as a shallow- or deep-chamber type, will terminate with peripheral synechiae. In the later stages of the disease the pathologic change concerned, particularly around the filtration angle, is usually masked by secondary manifestations, and the picture merges into one more or less similar for all primary glaucoma. In the terminal stages it is impossible, in many instances, to state from the microscopic sections what type of glaucoma initiated the process. Pathologic specimens obtained before the disease lost its entity are, therefore, most desirable and are the ones chosen for this study.

The pathologic change concerned is depicted in figures 3 to 8. These show the formation of the cuticular product

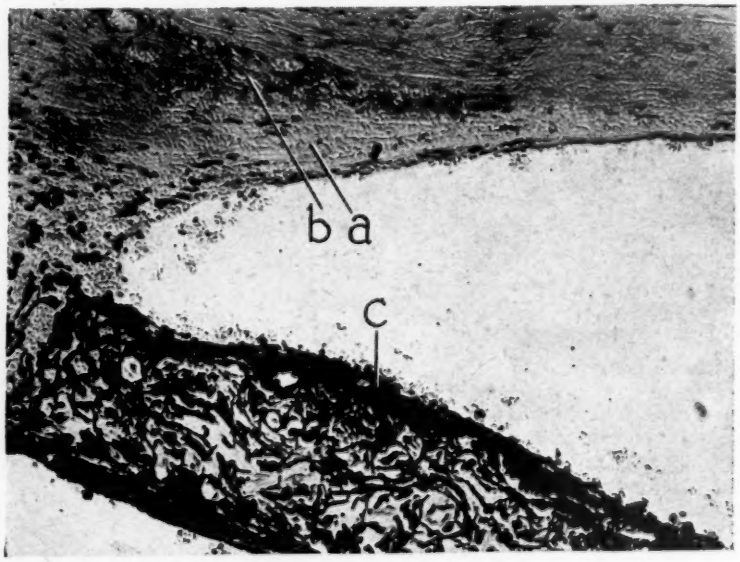

Fig. 7 (Reese). Deep-chamber glaucoma with open angle. The inner half of the trabecular area is replaced by a homogeneous hyaloid material (a) sparse in nuclei while the outer half still shows trabeculae with some pores (b). The iris (c) has some red blood cells along its anterior surface.

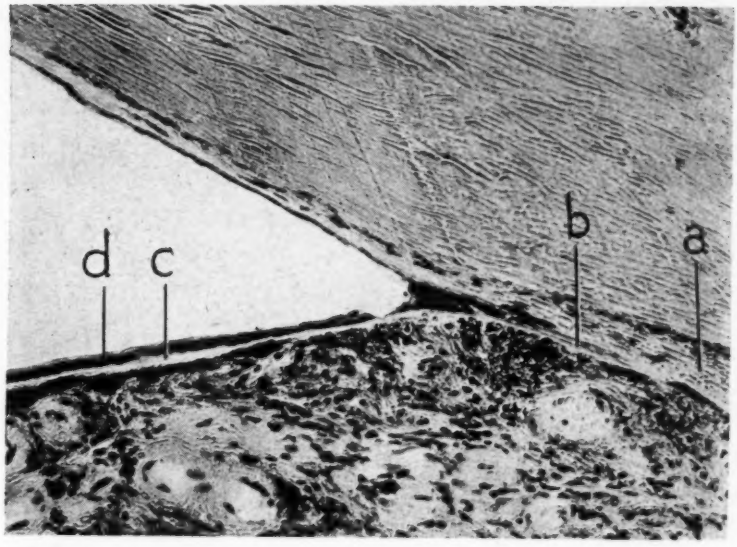

Fig. 8 (Reese). The angle is closed by a peripheral synechia. The trabecular area is replaced by a homogeneous hyaloid material (a). Between this and the iris stroma is a thin glass membrane (b) which continues on the anterior surface of the iris (c) and is covered by multiple layers of endothelium (d). This represents the opposite angle of the same eye to that shown in figure 3.

in the trabecular area and over the trabecular surface.

This cuticular product can be studied satisfactorily with the ordinary hematoxylin and eosin stains, but is better demonstrated by the Verhoeff elastic tissue, the Masson trichrome, and the Taenzer-Unna orcein stains.

Sometimes the cuticular product of the endothelium is laid down primarily in the interstices of the trabeculae, even to the point of completely obliterating them (figs. 6, 7, 8, 11); and the tendency is for the inner lamellae to be affected more than the outer. The filling of the interstices of the trabeculae with the hyaloid material may be the sole cause of the trabecular obstruction, or it may be combined with the formation of a glass membrane or Descemet's-like membrane along

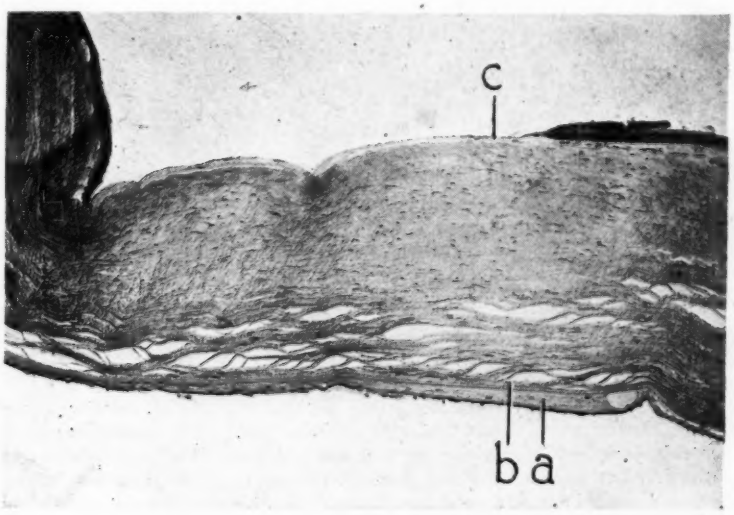

Fig. 9 (Reese). The cornea in a case of deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle. There is a second Descemet's membrane of irregular thickness (a) superimposed on the regular Descemet's membrane (b). At its thickest portion the acquired membrane is several times thicker than the regular membrane. Endothelial cells are along the surface and an occasional one is seen throughout the second membrane. The external corneal surface (c) shows the epithelium missing in part at the site of a bulla.

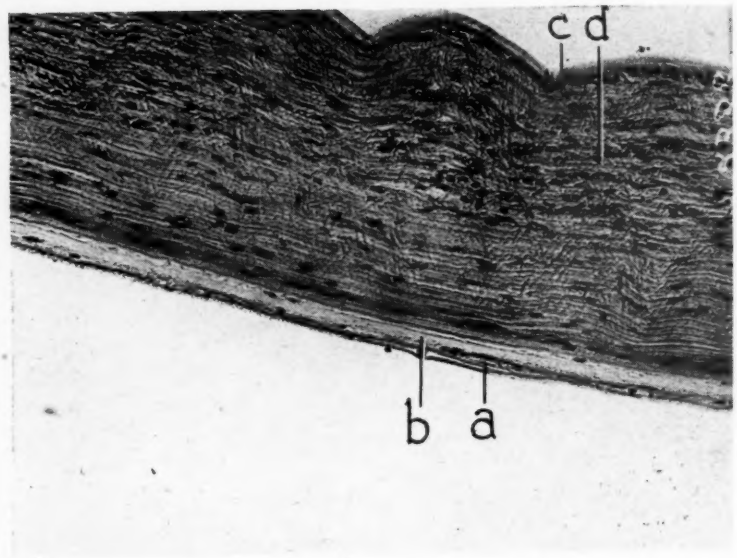

Fig. 10 (Reese). The cornea in a case of deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle. There is a second Descemet's membrane of irregular thickness (a) superimposed on the regular Descemet's membrane (b). Endothelial cells are evident along the surface and an occasional one is seen throughout the second membrane. The external corneal surface (c) shows the epithelium missing at the site of a bulla, and the underlying stroma shows infiltration with polymorphonuclear leukocytes (d).

the inner surface of the trabeculae (figs. 6, 8). Sometimes the Descemet's-like membrane along the inner surface of the trabeculae is solely responsible for the trabecular obstruction (figs. 3, 4, 5), and the trabeculae in these instances may be relatively normal in appearance except that the trabecular spaces are collapsed. The glass membrane over the trabecular surface is continuous with Descemet's membrane of the cornea and frequently continuous with a similar membrane over the anterior surface of the iris (figs. 3, 8, 11, 13). Sometimes this hyaloid membrane will be folded in the angle between the trabecular area and the iris (figs. 4, 6).

It is common in these cases for the endothelium of the cornea to produce a reduplication of Descemet's membrane

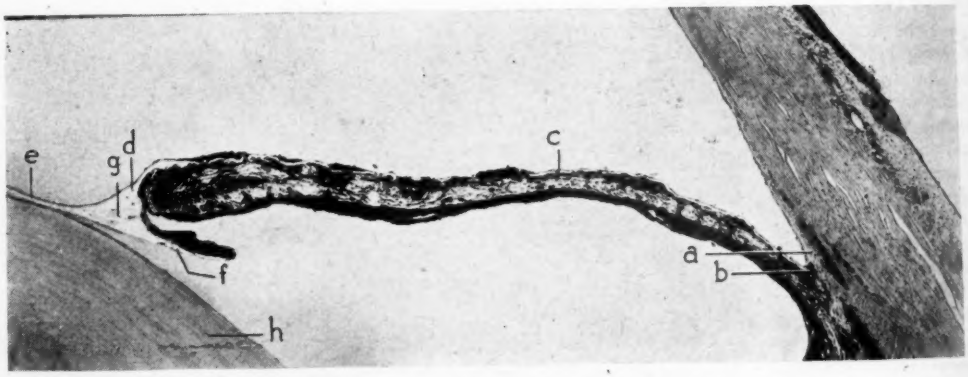

Fig. 11 (Reese). An advanced case of glaucoma due to the formation of a cuticular product in the filtration angle. The trabecular space is replaced by homogeneous hyaloid material (a) and over this peripheral synechiae have developed (b). The endothelium along the anterior surface of the iris has proliferated and formed a thin, irregular glass membrane (c). This endothelium and glass membrane are continued around the pupillary margin (d), over the anterior surface of the lens (e), and for a short distance back of the iris (f). At one site quite a thick layer of hyaloid material has been formed (g).The lens is shown at (h).

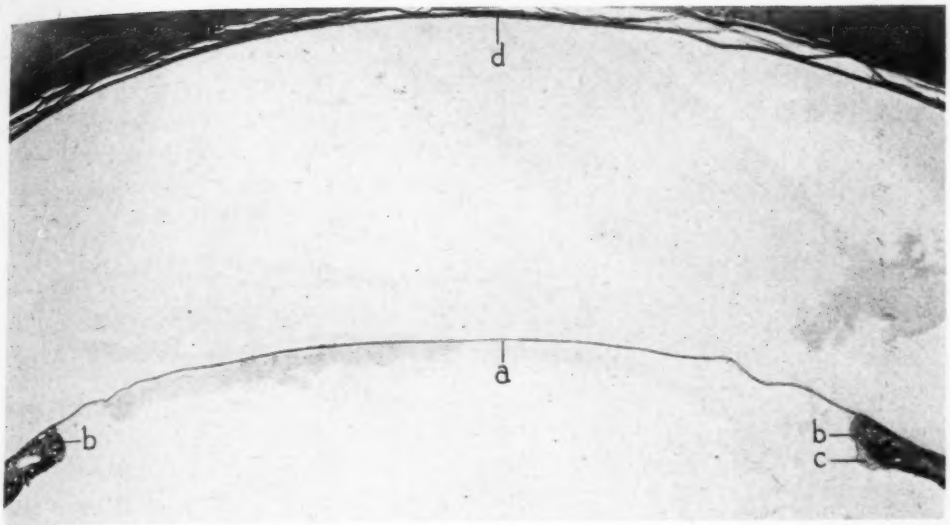

Fig. 12A (Reese). A case of glaucoma due to the formation of a cuticular product in the filtration angle. A glass membrane (a) extends across the pupillary area from one pupillary margin of the iris to the other (b, b). There are several endothelial nuclei along the anterior surface of the membrane which is continuous with a similar but less demarcated membrane along the anterior surface of the iris. Some of the cuticular product is also seen around the pupillary margin (c). There was a hypermature cataract which had become spontaneously subluxated. The cornea is shown at (d).

superimposed on the regular membrane (figs. 9, 10). The acquired membrane varies in thickness and is less homogeneous than the regular membrane. In places it may be several times thicker than the regular membrane and show endothelial nuclei scattered throughout its substance.

The corneal epithelium is edematous, elevated from the underlying Bowman's membrane, of irregular thickness, and frequently composed of several layers (fig. 9). Sometimes the epithelium is missing entirely, owing to a ruptured bulla (fig. 10), or a frank ulcer with infiltration of the underlying stroma by polymorphonuclear leukocytes (fig. 10).

Not only can the endothelium produce this hyaloid material at sites where it is

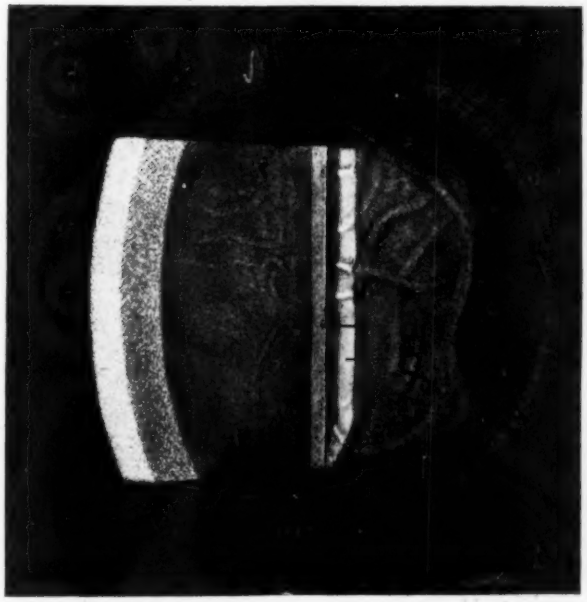

Fig. 12B (Reese). A slitlamp drawing showing the glass membrane in figure 12A. The transparent membrane (a) is seen crossing the pupillary area with the subluxated lens (b) posterior to it.

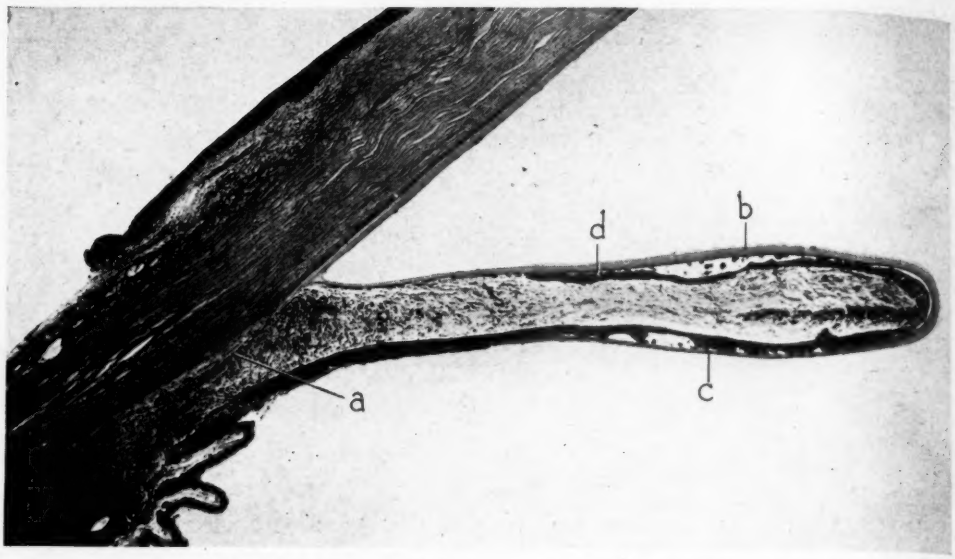

Fig. 13 (Reese). An advanced case of glaucoma due to the formation of a cuticular product in the filtration angle. There is a broad peripheral synechia (a). The entire anterior and posterior surfaces of the iris are covered with a glass membrane (b, c) which in places is thicker than Descemet's membrane. There is an ectropion uvea (d).

normally found, but it has the ability under provocation to grow over surfaces where it is not normally found and produce a glass membrane. It may grow across the pupillary area (figs. 11, 12A, B), over the anterior capsule of the lens, and along the posterior surface of the iris (fig. 13). If a trephine operation is performed on this type of case the endothelium may grow into the trephine opening and produce hyaloid material which partially fills the trephine opening and prevents filtration (fig. 14). This occurred in the four instances in which this operation was done.

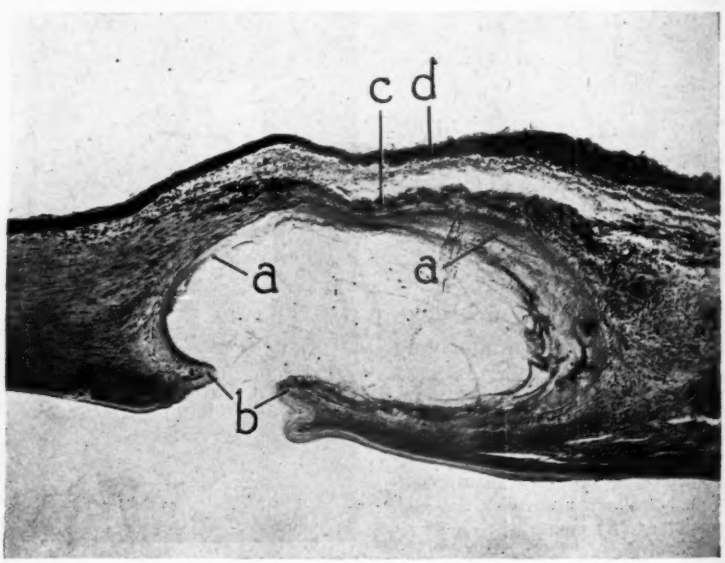

Fig. 14 (Reese). The site of a trephining operation performed on an eye with deep-chamber glaucoma due to the formation of a cuticular product in the filtration angle. The trephine opening is lined with a hyaloid cuticular product (a, a). This forms a definite glass membrane around the opening into the anterior chamber (b); the membrane is continuous with Descemet's membrane. c, represents a thin fibrous layer, and d, the conjunctiva.

Clinical characteristics and correlation with microscopic findings

Half of the 26 cases were thought clinically to be instances of primary glaucoma. The others were either diagnosed as secondary glaucoma, or the clinical records implied that secondary glaucoma was suspected. The clinical evidence, however, was mainly an inflammation of the eye which, in most instances, could have been secondary to the corneal lesion. The microscopic examination of the eyes showed actual endogenous uveitis in only six cases, and one of these was thought to be tuberculous. In one case, the condition was thought to be glaucoma secondary to occlusion of the central retinal vein. A history of trauma to the eye was regarded as a significant factor in six cases. Sixteen of the cases showed involvement of only one eye with no evidence of glaucoma mentioned in the fellow eye.

The corneal lesions were a most constant and conspicuous feature of the clinical and microscopic pictures. The condition of the cornea was mentioned clinically in all cases but two. The typical lesion was a cloudiness of the stroma and epithelium with a tendency to the formation of vesicles and bullae. These would rupture repeatedly until finally an ulcer developed. With the rupture of the epithelium and the formation of the ulcer, the inflammatory reaction of the eye became a prominent feature. Wrinkling of Descemet's membrane and insensitivity of the cornea were mentioned, and in one instance a comment was made to the effect that the condition resembled in every way dystrophia epithelialis corneae. The corneal process usually began in the central, or lower central, area. In the pathology reports of our cases the corneal changes were noted in 20 cases as ulcer, keratitis, or marked pannus.

Atrophy of the iris was a fairly common occurrence. Clinically, this ranged from rarefaction of the stroma to actual disappearance of the stroma at sites. In one case the diagnosis of essential atrophy was made due to the entire disappearance of the iris stroma in one sector. The clinical records mentioned atrophy of the iris in 10 cases and, as a result of this, corectopia was noted in three. In the microscopic reports, iris atrophy was mentioned in eight cases.

Spontaneous hyphema was mentioned in six of the clinical records while in the pathology reports, choroidal hemorrhage was noted in three instances, hemophthalmos in two instances. The not-infrequent occurrence of hemorrhage suggests the possibility that the endothelium of the blood vessels, as well as that of the anterior chamber, may be affected.

The general diseases mentioned in the clinical records were arteriosclerosis in eight, syphilis in two, high blood pressure in six, diabetes in one, Parkinsonian disease in one, and spastic paraplegia in one. A history of iritis was noted in two.

Excluding the cases in which there was definite trauma, the average age was 50 years. The ages ranged from 31 to 80 years. Twenty-three of the cases affected the white race and three the Negro race.

Trephine operations to relieve the intraocular pressure were done in four cases, and they were all ineffective. It is surprising that more operations were not attempted to relieve the intraocular pressure in this group of cases. The reason may be that the corneal lesion became prominent in the relatively early stage of the disease, led to much discomfort, and precluded further useful vision, so that enucleation was performed instead. The trephine operations were unsuccessful because the endothelium grew into the trephine opening and produced the hyaloid material which prevented filtration (fig. 14).

The clinical records show that miotics

were without effect. This is to be expected from the very nature of the lesion of the filtration angle.

The microscopic examination of these eyes revealed no tendency to excrescences of the lamina vitrea.

Cornea guttata was not mentioned in the fellow eye on the clinical records. In one case there was described a lesion of the cornea in the fellow eye and this could have been dystrophia epithelialis corneae.

There is very little that can be said regarding the examination of these eyes with the gonioscope. The corneal condition often prevented a view of the angle. On the record of one case there was a notation by Troncoso to the effect that the angle of the fellow eye was filled with what seemed to be an exudate. The cornea of this eye showed changes simulating dystrophia epithelialis corneae.

Literature pertinent to the subject

The fact that glaucoma is caused by sclerosis of the trabeculae is generally accepted, but, in reviewing the literature, one finds surprisingly little on this subject. What is meant by sclerosis of the trabeculae, its histologic picture, and its cause is hardly mentioned. Henderson,[1] in discussing the anatomic factors bearing on the pathogenesis of primary glaucoma, gave two: (1) a physiologic sclerosis of the cribriform ligament which was constant, and (2) a vascular factor which was variable. He claimed[2] that the cribriform ligament undergoes throughout life a progressive and physiologic sclerosis so that, starting as a cellular structure at birth, it becomes a purely fibrous formation in old age. The anatomic result of the sclerosis is to reduce greatly the interspaces and alveoli of the retiform structure and thus seriously impede the ready access of the aqueous to Schlemm's canal. He believed that the sclerosis is induced by the constant traction of the ciliary muscle on its ligament of attachment. The vascular factor, he thought, is vasomotor in nature and is the precipitating factor in an eye predisposed by the aforementioned sclerosis. Other precipitating factors mentioned were dilatation of the pupil, closure of the iris crypts, rise in arterial pressure, rise in venous pressure, and swelling of the lens.

Herbert[3] did not consider Henderson's deductions on the role of sclerosis of the pectinate ligament as a cause of glaucoma to be justifiable.

Priestley-Smith[4] felt that the theory of a primary sclerosis of the trabeculae was insufficient.

Verhoeff[5] concluded that sclerosis of the trabeculae is not a cause of glaucoma but a result of peripheral synechiae. This is based mostly on sections in which the iris appeared to be retracting from the trabecular surface, indicating that the synechiae had once been complete. The changes in the trabeculae were mostly along the surface and consisted in acquired tissue with more or less obliterated interstices of the trabeculae. The newformed tissue consisted of vascularized connective tissue, of hyalin, or elastic tissue, and, in one case, of tissue similar to that composing the iris stroma. He thought these changes were produced in the following way: During the persistence of the adhesions of the iris root to the trabeculae, the opening of the alveolar spaces into the anterior chamber became permanently obliterated by cell proliferation. If the iris pulled away early, a comparatively smooth surface remained. If the iris pulled away late, more or less of the tissue from the iris was left adherent to the trabecular surface. Over this surface, corneal endothelium grew and sometimes a hyalin layer formed, or even an elastic membrane identical to, and continuous with, Descemet's mem-

brane. He discussed the mechanism by which the separation of the synechiae from the trabecular surface might take place. In a later paper Verhoeff[6] stated, "in the absence of such synechiae obstruction to the outflow from the eye may no doubt exceptionally result from changes within the ligament itself."

Lamb[7] stated that sclerosis of the trabeculae was due to the formation of connective tissue from toxins of unknown origin.

Barkan, Boyle, and Maisler[8] felt that sclerosis of the trabeculae and pigment deposit in their interstices are a frequent, if not constant, finding in primary glaucoma.

In Raeder's[9] opinion a primary closure of the outflow of aqueous at the angle in the form of sclerosis of the trabeculae is often found.

Elschnig[10] stated that in deep-chamber glaucoma the trabeculae are usually more or less thickened and sclerosed.

Rones[11] stated that "with advancing years the fibers of the ligament become thicker and sclerosed. Pigment granules originating from the epithelium of the iris and ciliary body become enmeshed in the fibers and at times the accumulation of pigment is quite considerable. The thickened and pigmented pectinate ligament undoubtedly loses efficiency as a filtration mechanism, but as to whether this plays a role in the etiology of glaucoma simplex, as has been suggested, is difficult to say."

McLean[12] felt that sclerosis of the trabeculae could not be identified with the gonioscope. In the discussion of this paper Troncoso concurred.

References in the literature which support the thesis

Henderson[1] noted that at birth the cribriform ligament is purely a cellular structure of regularly arranged strands of spindle-shaped cells. Before long, however, the individual columns of cells developed around their respective centers, by a process of secretion or excretion, a homogeneous substance similar to that composing Descemet's membrane. With each advancing decade more and more homogeneous material is laid down by the covering cells.

De Vries[13] described the histologic findings in a glaucomatous eye in which the anterior chamber was of normal depth. The trabeculae were sclerosed and the interspaces replaced by a structureless homogeneous substance in which there were a few endothelial nuclei. Over the surface of the filtration angle there was a new-formed glass membrane. He thought the sclerosis was the result of irritating material or toxins passing through the trabeculae and affecting the endothelial cells.

Tartuferi[14] examined microscopically a case of chronic glaucoma with wide-open filtration angle in which the trabecular area showed a homogeneous structure with no interstices and only an occasional endothelial nucleus. Clinically, the eye showed a cloudiness of the central part of the cornea due to edema, while the peripheral portion was clearer.

Sarti[15] reported a similar case in which the trabecular region was replaced by a homogeneous tissue with no interspaces. Clinically, this eye also showed marked corneal changes described as a bulla which ruptured repeatedly and, because of pain, led to enucleation.

Polya[16] also described a case with the same type of pathologic change. The filtration angle was wide open and the interstices of the trabeculae, as well as the trabeculae, were replaced by a homogeneous structure. A Descemet's-like membrane covered with endothelium extended over the inner surface of the angle and coursed over the anterior surface of

the iris. Clinically, there was a corneal opacity which abraded from time to time, causing pain and a marked inflammation of the eye.

Greeves[17] described the pathologic findings in a deep-chambered glaucomatous eye in which the inner lamellae of the trabeculae were replaced by a homogeneous tissue poor in nuclei and the inner surface of the trabeculae was covered with a homogeneous membrane continuous with and similar to Descemet's membrane.

De Vries's[13] explanation of the cause of the so-called sclerosis of the trabeculae is that irritating substances leave the eye through the filtration system of the angle and exert a deleterious effect upon the endothelium, causing the trabecular surfaces usually lined by endothelium to adhere and thereby close the angle to the passage of aqueous. The same noxious factors may cause endothelial changes in the anterior chamber. If these toxic or irritating substances are less than lethal to the endothelium, they may produce an irritating effect on the endothelium, thus causing it to grow. In this way De Vries explains the growth of the endothelium and its formation of a Descemet's-like membrane around the filtration angle and over the anterior surface of the iris.

This theory of De Vries is not unlike the contention of Fortin,[18] that the passage of aqueous through the endothelium-lined spaces of the trabeculae and Schlemm's canal is comparable to the situation in the kidney. He claims that the endothelial cells of the filtering system of the eye can suffer from acute or chronic diseases just as the cells of the glomeruli of the kidney can, and that sclerosis of the trabeculae, and thus glaucoma, may be a sequela.

Summary

The endothelium of the anterior chamber may form a cuticular product at any site where it is normally found. It may also grow and produce this product over sites where it is not normally found; such as, over the trabeculae, across the pupillary area, or along the posterior surface of the iris. When this cuticular product is formed over the inner surface of the trabeculae or in the interstices of the trabeculae, glaucoma may ensue. This may occur as a primary disease with no apparent provocation. It also may occur as a result of inflammation in the anterior chamber, or as the result of trauma to the eye. The endothelial changes occur on the posterior surfare of the cornea and permit aqueous to enter the corneal stroma. This gives rise to edema and its sequelae, such as vesicles, bullae, pannus, keratitis, and ulcer. The increased intraocular pressure intensifies these corneal changes. The underlying pathologic change and clinical picture are similar to dystrophia epithelialis corneae on the one hand, and the corneal changes consequent to glaucoma on the other hand, except that in this condition both factors are present and therefore the cornea may dominate the clinical picture.

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PENICILLIN THERAPY IN OCULAR INFECTIONS*†

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With the employment of penicillin in the past year a significant advance was made in the chemotherapy of ocular infections. Penicillin is superior to sulfonamides in that it is effective in the presence of pus, secretion, and large numbers of organisms, and, so far as is known, does not inhibit the growth of corneal epithelial cells nor promote vascularization and scarring of the cornea. Encouraging clinical reports have already appeared, indicating that acute and chronic pyogenic infections of the eyeball and the surrounding soft tissues can be successfully treated by the local and general administration of penicillin: Abraham et al.[1] secured gratifying results from penicillin in acute and chronic conjunctivitis and cavernous-sinus thrombosis; Herrell[2] found penicillin effective in the treatment of orbital and facial cellulitis; Florey and Florey[3] obtained a large percentage of cures in 89 cases of blepharitis and acute and chronic conjunctivitis with and without corneal involvement; Griffey[4] reported a successful outcome in a case of gonorrheal conjunctivitis treated with this drug; Struble and Bellows[5] found the local application of penicillin effective in 13 cases of external ocular infections, but ineffective in 2 cases of exudative choroiditis and 1 case of gonorrheal iridocyclitis. In experimentally produced staphylococcic infections of the cornea (Robson and Scott[6]) and pneumococcic and staphylococcic infections of the anterior chamber (Von Sallman[7,8]) local applications of penicillin were effective in combating the infections. Because of the apparent growing importance of chemotherapy in the treatment of ocular infections it seemed desirable that further experimental and clinical observations with penicillin be reported.

METHOD OF TREATMENT OF OCULAR INFECTIONS

Unlike the sulfonamides, penicillin is ineffective when administered orally; therefore, there remain but two routes by which the drug can be administered: either parenterally—that is, intravenously or intramuscularly—or locally—that is, subconjunctivally or topically. Since the efficiency of a chemotherapeutic agent depends not only on its potency but also on its diffusibility and concentration in the infected tissues, it is of fundamental importance in establishing therapeutic principles to know the distribution and penetration of penicillin into the various ocular tissues and fluids after parenteral and local administration of the drug. Penicillin must be given in massive doses parenterally to reach a measurable concentration in the body tissues and fluids. However, since it has been demonstrated that some lots of penicillin are effective, *in vitro,* in dilutions even greater than 1 to 100,000,000 it is likely that bacteriostatic-effective concentrations may be present in the body even when the amount is too small to be assayed by the usual methods.* The concentration in the ocular tissues and fluids after the administration of a large intravenous dose is listed in decreasing order as follows:

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† Dr. K. K. Chen and his associates of the Lilly Research Laboratories gave valuable aid in this work.

* By the Florey method, amounts less than 0.1 or 0.2 Oxford units cannot be estimated.

extraocular muscles, sclera, conjunctiva, blood, tears, chorioretinal layer, aqueous and vitreous humors, and cornea. The fact that in some tissues penicillin reaches a higher concentration than in the blood indicates a possible selective absorption mechanism.[5]

When animals were given penicillin in comparable therapeutic dosages the staphylococcic cultures showed no clearing by the Florey method, indicating that the usual recommended dose of this drug is inadequate.

Upon subconjunctival or topical application, penicillin readily diffuses into the tissues and fluids of the anterior segment of the eyeball. The penicillin content in the cornea, conjunctiva, aqueous humor, iris, ciliary body, and scleral tissues is many times greater by this means than after massive intravenous doses. Only a moderate concentration of penicillin is found in the vitreous and the uveal and retinal layers (table 1).

Parenteral administration. It has already been stated that only by large intravenous or intramuscular injections can a measurable amount of penicillin be obtained in the posterior half of the globe. Thus, for deep infections of the eye and retrobulbar tissues, the parenteral route, although leaving much to be desired, is the only one available. In such cases, the recommended procedure is the administration of 100,000 units of penicillin (dissolved in 1,000 c.c. normal saline solution) by a continuous intravenous drip for 17 hours. This is followed by intramuscular injections of 1,250 units in 2 c.c. saline every 3 hours, day and night, for 48 hours. However, as a result of the experiments already mentioned (in which animals were given therapeutic dosages), these quantities of penicillin might result in concentrations too small to clear staphylococcic growths in the body tissues and fluids. Further such inadequate dosages may produce a penicillin-fast organism. Consequently, in serious infections where penicillin is indicated parenterally, it should be administered in much larger doses than those considered adequate up to the present time.

Local application. From the data previously mentioned, local penicillin therapy should be effective in combating infections of the anterior segment of the globe and the lids. It should also be of value in stepping up the concentration of the drug in the posterior segment when this method is combined with the parenteral administration. Penicillin has many of the properties required for an effective local therapeutic agent; namely, it is readily diffusible, effective in the presence of purulent secretion and autolytic products, only slightly toxic to leucocytes, and nonirritating to the ocular tissues even in concentrations as high as 20,000 units per cubic centimeter of solution.

TABLE 1

CONCENTRATION OF PENICILLIN IN THE GLOBE AFTER CONSTANT CORNEAL BATHS
(20,000 units per c.c.)

Component of Globe	Concentration in Oxford Units per gram or c.c.		
	0.5 hour	1 hour	3 hours
Aqueous humor	3.32	4.18	14.2
Conjunctiva	114.11	177.63	26.34
Cornea	46.23	90.42	27.47
Iris and ciliary body	30.49	35.0	9.18
Vitreous humor	0.92	1.95	trace
Sclera	39.76	57.13	?
Posterior uvea and retina	trace	trace	?

As is the case when penicillin is administered parenterally, the solution for local application must be fresh, for even though some lots of penicillin keep their potency if kept cold for a long time, the average sample of penicillin, once placed in solution, begins to lose its potency rapidly. Therefore, it is advisable that no

greater amount of penicillin be put into solution than will be utilized within 24 to 48 hours. The strength of the solution that has been recommended for surface application is 200 to 500 units per cubic centimeter. In this investigation it was thought better to err on the side of too large rather than too small doses for fear that a penicillin-fast organism might develop. Therefore, the solution most frequently employed was one containing 2,500 units of penicillin per cubic centimeter. A drop of the solution was instilled into the conjunctival sac every hour, day and night, except in the less serious cases, in which the drops were used during the waking hours only. Between applications, the penicillin solution was kept in an ice chamber. In cases of severe corneal ulcer the penicillin solution was applied in the form of a constant corneal bath for one hour or more several times a day. For this purpose a Barkan's plastic contact lens or some suitable substitute is satisfactory.[9] Von Sallmann and Meyer[10] recently have advocated the use of iontophoresis in order to increase the concentration of penicillin in the anterior segment of the eyeball.

Experimental

Because of the growing importance of local penicillin therapy, this subject is dealt with in detail. The problem of local therapy is essentially that of devising some means of applying the drug so that an adequate concentration is maintained at the site of infection. If a solution be employed, it is necessary to apply the "drops" at very frequent intervals because of its dilution by the tears and subsequent loss through obvious channels. Powdered penicillin would be effective somewhat longer than the solutions, but it has been reported to be irritating to surface wounds and therefore should not be used on the eyeball until further investigated. Moreover, this method would necessitate the use of large amounts of the drug. This would be unwarranted for such relatively minor infections as those of the lids and conjunctiva. An ointment, if it would not adversely influence the penicillin, would be superior to solutions or powders inasmuch as it would be less affected by tears and require less frequent application. Florey and Florey in their report stated that they employed vaseline as a base and obtained satisfactory results with such an ointment.

An ointment, to be effective, should have the following properties: It must allow close contact of the active agent with the site of infection; be miscible with secretions; not form an inert or impermeable covering, and not be difficult to remove. The following investigation was undertaken to determine which base would be most suitable for local penicillin therapy. The most important property of such a base is its allowing intimate contact and penetration, without harming the tissues. Fortunately, the determination of these factors are relatively simple as is shown by the following experiments.

To 10 grams of each of the following bases 25,000 units of penicillin dissolved in 0.25 c.c. distilled water were added and mixed:

(a) Grease base
Simple Ointment (U.S.P.)

	%
Unguentum album	
Wool fat	5
White wax	5
White petrolatum	90

(b) Oil-in-Water Emulsion-Type Base

	%
Sodium lauryl sulphate	1
Stearyl alcohol	10
Cetyl alcohol	3
Spermaceti	10
Glycerine	15
Water	61

(c) "Vanishing"-Type Stearate Base

	%
Carbitol	10
Stearic acid	20
Peanut oil	4
Potassium hydroxide	1
Water	65

(d) Lubricating Jelly, consisting of tragacanth, quince-seed extract, glycerin, and aromatic oils, and sodium ethyl mercuric thiosalicylate (Lilly) 1:1000 as a preservative.

Twelve rabbits were anesthetized by intravenous injections of sodium amytal. An excess of the preparation to be tested was placed into the conjunctival sac and over the cornea of the eye for one hour. The eyes were staggered in a manner so that every rabbit received a different preparation in each eye, making a total of six determinations for each preparation. At the end of the designated period, the aqueous humor was aspirated from each eye and was tested immediately by the cup method for its penicillin content.

Table 2 shows the penetration of penicillin combined with various types of bases. The penetrability of penicillin in ointments listed in descending order are: "vanishing"-type stearate base, simple ointment, oil-in-water emulsion, and lubricating jelly. The actual concentration of the drug in the conjunctival and corneal tissues is much higher than the aqueous level. The penicillin in the "vanishing"-type stearate base in some instances caused a corneal haze. Upon instillation of fluorescein a diffuse staining of the cornea was revealed. This damage to the epithelium probably was a factor in furthering the penetrability of the penicillin. From these observations, it would seem that the most suitable base for penicillin therapy in ocular infections is the simple ointment (U.S.P.). In this form it remains in the conjunctival sac for a moderate interval of time and leads to a satisfactory concentration in the tissues without causing any damage. An oil-in-water emulsion is the next most satisfactory base. The least penetration of penicillin occurred in the presence of a lubricating jelly.

TABLE 2

THE EFFECT OF VARIOUS BASES UPON THE PENETRATION OF PENICILLIN THROUGH THE CORNEA*

Simple Ointment	Oil-in-Water Emulsion	"Vanishing"-Type Stearate	Lubricating Jelly
A	B	C	D
0.43	0.64	5.19	0.10†
0.47	0.98	3.90	0.10†
0.30	0.10†	3.90	0
0.43	0.10†	2.53	0
0.10†	0.10†	2.80	0
0.79		2.23	0.10†
Avg. 0.42	0.38	3.43	0.05

* 25,000 units of penicillin per gram base.
† Approximate value.

TABLE 3

PENETRATION OF PENICILLIN THROUGH CORNEA AFTER CORNEAL BATH AND SUBCONJUNCTIVAL INJECTION

	Corneal Bath	Subconjunctival Injection
Concentration:	20,000 units per c.c.	2,500 units (total)
Time:	1 hour	0.5 hour
1	2.96	0.64
2	3.39	0.43
3	4.33	2.70
4	6.05	0.80
Average	4.18	1.04

Although the conditions are unequal, the penetration resulting from a constant corneal bath and from a subconjunctival injection are shown for comparison in table 3. Although the penetration of penicillin in a "vanishing"-type stearate base approximates that obtained when a constant corneal bath with 20,000 units is employed, it is achieved only at the cost of corneal damage. The penicillin content of the tissues of the globe was not determined after application of the

ointment, but it is probably proportionate to the values obtained following corneal baths (table 1).

The clinical application of penicillin in ocular infection

From the experimental data already given, it was shown that a high concentration of penicillin can be achieved in the adnexa and tissues of the anterior segment, whereas the concentration within the posterior segment of the globe is, at the very best, minimal. As a corollary to this, it might be expected that external ocular tissues, because of their accessibility, are readily cured by the use of this drug, whereas deep infections respond poorly or not at all. The correctness of this supposition is borne out by the following clinical reports of 46 cases of ocular infections which were treated with penicillin. In most instances, bacteriologic tests were made including blood-agar cultures and smears stained with Giemsa and Gram stains. It was found convenient to divide the cases in this report into six groups as follows:

Group I: Acute and Chronic Staphylococcic Infections of the Conjunctiva and Lids.

TABLE 4

Effect of penicillin on acute staphylococcic conjunctivitis

Patient	Cultures and Smears	Penicillin units per c.c.	Results
1. C. M.	Hemolytic Staphylococcic albus	500	Improved in 24 hours; cured in 48 hours
2. J. D.	Nonhemolytic Staphylococcus albus	2,500	Secretion ceased in 24 hours; cured in 48 hours
3. R. K.	Culture negative. Smear showed staphylococci	2,500	Improved in 24 hours; cured in 48 hours
4. M. H.	One colony of nonhemolytic Staphylococcus albus	200 later 500	Right eye cured in 10 days; left eye cured in 3 days
5. C. L.	Nonhemolytic staphylococcus	2,500	Improved in 48 hours; cured in 96 hours
6. N. W.	Hemolytic Staphylococcus albus and Koch-Weeks diplobacillus	500	Cured in 48 hours
7. N. J.	Nonhemolytic Staphylococcus albus	2,500	Cured in 48 hours
8. V. W.	Smears showed staphylococcus	2,500	Improved in 24 hours; cured in 48 hours
9. D. H.	Nonhemolytic staphylococcus and inclusion bodies	2,500	The acute manifestations subsided within 24 hours
10. R. S.	Nonhemolytic Staphylococcus albus	200	Eye cured in 12 hours
11. M. G.	Nonhemolytic Staphylococcus aureus	2,500	Greatly improved in 24 hours; cured in 48 hours
11a. E. D.	Nonhemolytic Staphylococcus aureus	2,500	Marked improvement in 48 hours

Group II: Streptococcic Infections of the Conjunctiva.

Group III: Corneal Ulcers and Episcleritis.

Group IV: Unidentified Infections of the Conjunctiva. In this group bacteriologic tests were either negative or not carried out.

Group V: Miscellaneous Infections of

Conjunctiva and Lids. This group consisted of four cases of conjunctivitis. There was one case each of the following infections—gonococcus, Koch-Weeks diplobacillus, inclusion bodies, and an unidentified gram-positive organism. One case of hordeolum was also included.

Group VI: Infections of the Uvea. This group included one instance of gonococcal uveitis and two of exudative choroiditis of undetermined cause.

GROUP I: ACUTE AHD CHRONIC STAPHYLOCOCCIC INFECTIONS OF THE CONJUNCTIVA AND LIDS (table 4)

(a) *Acute staphylococcic conjunctivitis.* There were 12 cases (8 bilateral and 4 unilateral) of acute conjunctivitis caused by a Staphylococcus. The organisms identified by blood-agar culture were hemolytic and nonhemolytic Staphylococcus albus and nonhemolytic Staphylococcus aureus. Of the 12 cases, penicillin was administered to 4 bilaterally and to 8 unilaterally. Two bilateral cases and 7 unilateral cases responded rapidly to the drug so that clinical cure occurred within 12 to 48 hours.

In case 4 (M. H., the slowest to respond to treatment) it was questionable whether the causative agent was a Staphylococcus, for after three attempts at culture growth one colony of nonhemolytic Staphylococcus albus only was found. The inflammatory signs, which improved slowly with 200 units of penicillin per cubic centimeter of solution, became rapidly better when the concentration was increased to 500 units per cubic centimeter. The clinical cure required 10 days. At this time, the second eye became involved and, in contrast to the first, cure was complete in three days.

In case 9 (D. H.) in which there was a negative history regarding exposure in a swimming pool, the patient had inclusion bodies in addition to staphylococci. The acute manifestations undoubtedly caused by the staphylococci subsided within 24 hours, whereas the chronic inflammation showed no improvement until the third week, at which time there was a noticeable change for the better. No definite conclusion can be drawn, because unavoidable circumstances prevented further observation. If this case, which presented neither pannus nor scarring of the conjunctiva, was one of true trachoma it is the only such recorded case treated with penicillin. In three of the bilateral cases, two of the less severely inflamed eyes received 0.2-percent zinc-sulphate solution

TABLE 5

COMPARISON OF PENICILLIN WITH OTHER FORMS OF THERAPY

Patient	Culture and Smears	Cure with Penicillin Therapy	Cure in Control
J. D.	Nonhemolytic Staphylococcus albus	2 days	Over five days with zinc sulphate 0.2 percent
M. G.	Nonhemolytic Staphylococcus aureus	1 day	Over three days with 10 percent argyrol
N. W.	Hemolytic Staphylococcus albus and Koch-Weeks diplobacillus	2 days	Three days with zinc sulphate 0.2 percent
W. T.	Streptococci	2 days	Two days with metaphen 1–2,500 aqueous solution

and one received 10-percent argyrol. In all three instances, a clinical cure occurred in a shorter period in the eye receiving penicillin (table 5).

(b) *Chronic staphylococcic conjunctivitis.* In chronic conjunctivitis, the results obtained by treatment with penicillin are quite spectacular. In this group there were seven cases in which the infectious agent was either hemolytic or nonhemolytic staphylococci (table 6). The infections had persisted from 2 months to 15 years in spite of the usual forms of therapy. All but one case were cured in a few days to three weeks. For example, in case 17, H. G., whose conjunctivitis had persisted for 15 years, was cured in three weeks with penicillin therapy. In case 15 (J. G.), the infectious agent (nonhemolytic Staphylococcus albus), disappeared within two days, but the hot, dry, gritty sensation persisted. The corneas, after staining with fluorescein, revealed fine punctate staining areas, and the Schirmer test disclosed a deficiency of tears. Case 13 (L. A.), was interesting in that the ocular infection present for six months was probably secondary to sycosis vulgaris, a staphylococcic infection of the face. In spite of vigorous treatment, the conjunctiva remained inflamed and discharge and tearing profuse. Within 48 hours after penicillin therapy was instituted, a marked improvement was noted, and the conjunctiva and lids were completely cured in six days. Treatment was stopped at this time and within a few days reinfection took place from the skin of the face. This time the penicillin therapy was directed not only to the eyes but also to the skin in the form of an ointment composed of an emulsion base. Marked improvement in eyes and face occurred within two days and the eyes were considered normal in a week.

TABLE 6

EFFECT OF PENICILLIN IN CHRONIC STAPHYLOCOCCIC CONJUNCTIVITIS

Patient	Duration	Cultures and Smears	Remarks
12. A. M.	2 months	Nonhemolytic staphylococci	Improved in 24 hours; cured in one week
13. L. A.	6 months	Staphylococci (sycosis vulgaris)	Improved in 48 hours; cured in six days. Reinfection from the face occurred when drug was stopped; lids improved when medication was resumed
14. E. K.	5 months	Hemolytic Staphylococcus albus	Cured in two days
15. J. G.	? years	Nonhemolytic Staphylococcus albus	Slight improvement in two days, but no improvement in the gritty, dry, and hot sensation. Schirmer test revealed lack of tears
16. J. E.	3 months	Staphylococci	Moderate improvement in four days. Developed signs of drug hypersensitization
17. H. G.	15 years	Staphylococci and diphtheroids	Improved in three days; cured in three weeks
18. G. T.	2 years	Nonhemolytic staphylococcus	Infected eye socket. Redness and purulent discharge decreased in two days and discharge absent after five days

(c) *Chronic blepharoconjunctivitis and dacryocystitis.* Five cases of chronic blepharoconjunctivitis were treated with penicillin (table 7). In case 19 (M. V.), cultures showed nonhemolytic staphylo-

cocci. Remarkable improvement occurred in two days and the condition was cured in two weeks. The drug was continued for 3 days beyond this period, making a total of 17 days' treatment. Observation was continued for one month but there was no recurrence. Case 20 (J. F.), diagnosed as acne rosacea and blepharoconjunctivitis, in which culture revealed nonhemolytic Staphylococcus albus, did not respond to penicillin therapy within 10 days. At that time, a multivitamin preparation was prescribed and the penicillin continued, resulting in a moderate improvement in about two weeks, when observations were unavoidably discontinued. Case 21 (R. M.), in which cultures and smears were negative, was cured in eight days. The treatment was continued for an additional week. Case 23 (D. C.), in which cultures were negative but smears showed an occasional staphylococcus, there was seborrheic dermatitis of the face and scalp. The eyelids were covered with scales and crusts and the conjunctivas of both eyes were inflamed. Following three weeks of penicillin therapy, the lid margins were greatly improved, but the conjunctivas remained inflamed. In case 24, D. D., also suffering from seborrheic dermatitis, had negative ocular smears and cultures. The lid margins had a great many scales and crusts. After the use of penicillin for seven days, the inflammation and crusts disappeared from the lid margins and the conjunctiva became normal. In case 22, S. L. was a 19-day-old infant with dacryocystitis caused by congenital stenosis. Treatment consisted of penicillin drops. The first smear showed staphylococci. Subsequent smears were negative but the quantity of pus expressed from the sac remained unchanged for over three weeks. After this time, a great improvement was noted, probably as a result of the frequent expressions.

TABLE 7

PENICILLIN THERAPY IN CHRONIC BLEPHAROCONJUNCTIVITIS AND IN DACRYOCYSTITIS

Patient	Diagnosis	Cultures and Smears	Remarks
19. M V.	Blepharoconjunctivitis	Nonhemolytic staphylococci	Conjunctiva normal in 48 hours; lids normal in 2 weeks; drug stopped after 17 days
20. J. F.	Blepharoconjunctivitis and Acne rosacea	Nonhemolytic Staphylococcus albus	No improvement in 10 days, then multivitamin preparation was prescribed and penicillin continued. Marked improvement by third week.
21. R. M.	Blepharoconjunctivitis	Smears and cultures negative	Improvement noted in five days; cured in eight days
22. S. L.	Closure of nasolacrimal duct in newborn	Staphylococci	Secretion continued but became sterile
23. D. C.	Blepharoconjunctivitis associated with seborrheic dermatitis	Occasional staphylococcus	Moderate improvement shown in lid margins, but conjunctiva remained red, even after three weeks of penicillin therapy
24. D. D.	Blepharoconjunctivitis associated with seborrheic dermatitis	Negative	Lids and conjunctiva cured in seven days

GROUP II: STREPTOCOCCIC INFECTIONS OF THE CONJUNCTIVA

There were three cases in this group. In one streptococci occurred in short chains and in another Streptococcus

viridans in a pure culture (table 8). Both of these cases were cured with penicillin in 48 hours. In the case of the third patient (case 27), the conjunctivitis was associated with a severe corneal ulcer and is discussed in that section (group III).

TABLE 8

PENICILLIN THERAPY IN ACUTE STREPTOCOCCIC CONJUNCTIVITIS

Patient	Culture	Remarks
25. W. T.	Streptococci (short chains)	Secretion absent in 24 hours; culture and smears negative in 48 hours
26. J. C.	Pure culture of Streptococcus viridans	Right eye cured in 48 hours; left eye cured in 36 hours
27. H. S.*	Hemolytic streptococci	Corneal ulcer and conjunctivitis cured in six days

* See table 9.

GROUP III: CORNEAL ULCERS AND EPISCLERITIS

There were three cases of corneal ulcers (table 9). Two cases (10, R. S., and 11, M. G.), already mentioned in the section on acute staphylococcic conjunctivitis, are also included in this group. The marginal ulcers and conjunctivitis in these cases were cured in 12 hours and 48 hours, respectively. A third case (27, H. S.), also mentioned in the series of streptococcic-conjunctivitis cases, presented a progressive corneal ulcer with marked generalized injection and blepharospasm. Cultures taken from the ulcer and conjunctiva revealed a hemolytic streptococcus. The patient was treated with penicillin drops hourly (2,500 units per cubic centimeter), day and night, combined with a solution of similar concentration. Progress of the corneal ulcer stopped in 24 hours, and the congestion and belpharospasm lessened noticeably. The corneal lesion, although gradually decreasing in size, stained with fluorescein for six days, leaving a macular corneal scar. Two weeks later, the scar was considerably smaller and nebular in character.

Three cases of episcleritis were treated with penicillin drops (table 9). In one case, the eye became white in 24 hours, whereas in the other two cases, the eyes improved more slowly and were not considered cured until after one week had elapsed (table 9).

GROUP IV: UNIDENTIFIED INFECTIONS OF THE CONJUNCTIVA

There were 9 cases of conjunctivitis (6 acute and 3 chronic in type) in which smears and cultures were either negative or were not taken (table 10). In case 31, C. P. had a severe unilateral acute conjunctivitis in which marked generalized injection, edema of the lids, and slight secretion were present. Cultures and smears were negative. The eye was completely normal in three days following penicillin therapy. The other five acute cases of conjunctivitis in this group were cured in 12 to 72 hours. The three cases of chronic conjunctivitis belonging to this group were cured in 2, 3, and 8 days.

GROUP V: MISCELLANEOUS INFECTIONS OF THE CONJUNCTIVA (TABLE 11)

Gonorrheal ophthalmia. C. P. (case 40) was seen on the fifth day of the acute conjunctival infection of the left eye. All this time there were severe swelling of the lids, chemosis, and profuse purulent discharge in which gram-negative diplococci were found, intra- and extracellularly. Boric-acid irrigations and instillations of

TABLE 9

EFFECT OF PENICILLIN IN CORNEAL ULCERS AND IN EPISCLERITIS

Patient	Organism	Remarks
10. R. S.	Nonhemolytic Staphylococcus albus	Marginal ulcer cured in 12 hours
11. M. G.	Nonhemolytic Staphylococcus aureus	Marginal ulcer cured in 24 hours
27. H. S.	Nonhemolytic streptococcus	Deep corneal ulcer treated with corneal baths. Progress of ulcer stopped in 24 hours. Staining area gradually decreased, no staining after six days
28. A. O.	Episcleritis	Eye white in one week
29. M. T.	Episcleritis	Eye white in 24 hours
29a. W. L.	Episcleritis	Eye white in one week

penicillin every 30 minutes led to a marked improvement within 24 hours, indicated by the absence of organisms in smears and objective findings. The conjunctiva was entirely normal on the tenth day.

Koch-Weeks conjunctivitis. One case of acute Koch-Weeks conjunctivitis with secondary staphylococcal infection was treated with penicillin. The eye was cured in 48 hours.

Trachoma (?). In case 9, D. H., already mentioned in the section on acute staphylococcus conjunctivitis, a young Negro soldier, had a history of having had "red eyes" for over five months. The redness became markedly worse a week before penicillin was administered. Smears stained with Giemsa revealed inclusion bodies, and cultures showed colonies of nonhemolytic Staphylococcus albus. Pannus formation and scarring of the palpebral conjunctiva were absent. The acute manifestations subsided within 24 hours after instituting treatment. Smears and cultures taken in 48 hours were negative. After two weeks, the chronic inflammation gradually subsided. This is the first reported case of probable trachoma treated with penicillin.

Acute conjunctivitis caused by an un-

TABLE 10

EFFECT OF PENICILLIN IN CONJUNCTIVITIS OF UNKNOWN CAUSE

Patient	Type	Culture and Smears	Remarks
30. F. R.	Acute	Not taken	Cured in 24 hours
31. C. P.	Acute with edema of lids	Negative	Cured in three days
32. C. R.	Chronic	Not taken	Cured in eight days
33. L. K.	Chronic	Negative	Cured in three days
34. J. P.	Acute	Negative	Cured in three days
35. D. B.	Acute	Negative	Cured in 24 hours
36. H. B.	Acute	Not taken	Cured in 12 hours
37. C. M.	Acute	Negative	Cured in three days
38. J. F.	Chronic	Negative	Improved in 24 hours; cured in 48 hours

identified small gram-positive organism. Case 39 (H. H.) was that of an acute conjunctivitis from which small gram-positive organisms were recovered. Recovery was complete in 24 hours with penicillin therapy.

Hordeolum. One case of hordeolum, seen in its third day, was treated with penicillin drops and ointment. Marked improvement was noted in 24 hours. On the third day of treatment, the patient developed a hypersensitization reaction on the skin of the lids.

TABLE 11

PENICILLIN THERAPY IN MISCELLANEOUS INFECTIONS OF CONJUNCTIVA AND LIDS

Patient	Diagnosis	Remarks
6. N. W.	Koch-Weeks conjunctivitis with secondary staphylococcic infection	Cured in 48 hours
9. D. H.	Trachoma (inclusion bodies and nonhemolytic Staphylococcus albus	Acute manifestation subsided in 24 hours; chronic manifestations became noticeably improved after three weeks' therapy
39. H. H.	Conjunctivitis due to an unidentified small gram-positive organism	Eyes normal in 24 hours
40. C. P.	Acute gonorrheal conjunctivitis	Marked improvement in 24 hours. Conjunctiva normal in 10 days
41. B. F.	Hordeolum, third day (hemolytic Staphylococcus albus)	Marked improvement in 24 hours, obtained with penicillin drops and ointment

GROUP VI: UVEAL INFLAMMATION

There were three cases in this group, two of chronic exudative choroiditis and one of gonococcal iridocyclitis. Massive doses of penicillin administered parenterally and locally seemed to have little or no influence on the progress of the disease.

LOCAL TOXIC MANIFESTATION OF PENICILLIN

Up to the present time, there have been no reports indicating that the local application of penicillin produces a drug hypersensitization. This phenomenon must be differentiated from another group of reactions consisting of redness and swelling of the conjunctiva and skin surrounding the eyes observed after the use of certain samples of penicillin. Four of the cases receiving penicillin therapy for ocular infections developed true hypersensitization reactions. As far as the writer is able to determine, this is the first report of such reactions developing during the course of penicillin therapy. Case 11 (M. G.), treated for acute staphylococcic conjunctivitis with a marginal ulcer, was cured in one day. Two weeks later, the patient returned with bilateral conjunctivitis with follicles which did not respond to penicillin, even though the smears, which at first showed staphylococci, became negative. On the fifteenth day of penicillin treatment, hypersensitization phenomena appeared on the lids, as manifested by redness and edema. Later the skin became wrinkled, itchy, and scaly. When the penicillin was stopped, the skin returned to a normal state in a few days. At this time, fresh penicillin was instilled for one day, causing the reappearance of the hypersensitization phenomena. The drug was entirely discontinued in this

case. In case 16, J. E., treated for chronic staphylococcic conjunctivitis, developed redness, swelling, and itchiness of the lids on the sixth day. A patch test showed hypersensitization to penicillin. Case 30 (F. R.) was treated with penicillin for acute conjunctivitis in which smears and cultures were negative. The eye became white within 24 hours. Several weeks later, the patient developed an acute bilateral conjunctivitis. Pencillin drops were prescribed. The next day, the patient developed a marked redness, edema, and itchiness of the skin of the lids followed by wrinkling and scaliness. In case 40, J. F., suffering from an hordeolum, was treated with penicillin drops and ointment. The swelling and redness of the hordeolum subsided within 24 hours. The medication was continued for two more days and on the third day, redness, edema, and itchiness developed, which was followed by wrinkling and scaliness. The patch test with powdered penicillin was positive.

Comment

It could be predicted from the laboratory experiments that the best results from penicillin therapy would be obtained in external ocular infections, rather than those involving the posterior segment. The clinical observations of Florey and Florey and those reported herein confirm this prediction.

In the evaluation of penicillin therapy, the rapidity of improvement must be considered in both acute and chronic ocular infections. If in acute infections the time required to obtain a cure with penicillin is repeatedly less than with the usual therapeutic methods, it may be assumed that the drug was effective. In chronic infections, particularly those in which other methods have been unsuccessful, if rapid improvement follows the institution of penicillin therapy, it is likely that the drug was instrumental in bringing this about. Yet, another means of appraising penicillin therapy is available in cases of bilateral ocular infections. In such instances, one eye, preferably the worse one, is treated with the drug while the second eye is the control. Although the number of cases in this series is small, penicillin, evaluated by these criteria, has proved to be of value in external ocular infections caused by penicillin-sensitive organisms. Thus, in 10 out of 12 cases of acute staphylococcic conjunctivitis cure was achieved within 48 hours. In case 5 (C. L.), in which the drops were used infrequently, it took 96 hours for a cure. In case 4 (M. H.), wherein the response to penicillin was slow, it was questionable, as already stated, whether the staphylococcus was the causative agent. It has also been demonstrated that rapid cure occurred in the cases of acute conjunctivitis due to some other organisms.

Even more remarkable and therefore confirming the efficacy of penicillin in external ocular infections, was the rapid improvement or cure in the cases of chronic conjunctivitis. In most of these, the infections had been treated by other means during periods of months or even years. Cure within a few days or weeks, in such instances, is certainly a strong indication that penicillin was an important agent in the rapid healing. Where penicillin did not cure, the failure could be attributed to such associated factors as keratoconjunctivitis sicca, acne rosacea, or drug hypersensitization.

It is quite possible that penicillin might prove to be equal to silver nitrate without the disadvantages of the latter in the prophylactic treatment of gonorrheal ophthalmia of the newborn. Further it may be used as a preventive measure for intraocular infections following surgery. This would be particularly helpful where bacteriologic tests are impractical prior to intraocular surgery.

Summary and Conclusions

1. Penicillin reaches the ocular tissues within a few minutes after intravenous injection.

2. After a large dose of penicillin is administered intravenously, it appears in the ocular tissues listed in decreasing order of concentration as follows: extraocular muscles, sclera, conjunctiva, blood, tears, chorioretinal layer, aqueous and vitreous humors, and cornea. It has never been detected in the crystalline lens. In this respect, the lens is similar to the cerebrospinal fluid, brain, and nerve tissues.

3. Local application of penicillin leads to a very high concentration of the drug in the tissues of the anterior segment of the globe.

4. The following four ointments, in which the penetrability of penicillin was tested, are listed in the order in which they are clinically recommended: simple ointment, oil-in-water emulsion, and lubricating jelly. The "vanishing" stearate type of a base, in which penicillin seems to have the greatest power of corneal penetration, is not recommended because of its possible damage to the corneal epithelium. However, it may be used on the skin of the lids.

5. Penicillin was found to be effective in the clinical treatment of acute and chronic infections of the lids, conjunctiva, and cornea produced by penicillin-sensitive organisms.

6. It was found ineffective in two cases of exudative choroiditis of undetermined origin and in one case of gonorrheal iridocyclitis.

7. Susceptible individuals may become hypersensitive to penicillin.

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Discussion

Dr. H. S. Gradle: Has Dr. Bellows any information as to the penicillin concentration in the secondary aqueous.

Dr. Bellows: Very little work has been done on that. When massive doses are given intravenously the amount of penicillin goes up very slowly for a whole hour. If the first aqueous is removed during this time, the second aqueous shows a higher concentration of penicillin.

However, a similar rise occurs in aqueous humor for the first hour without paracentesis; that is, if samples of primary aqueous humors are examined at 15, 30, 45, and 60 minutes, each sample will be successively higher in concentration. The second aqueous, removed at the end of a 30-minute period, for example, does not contain much more penicillin than does the first aqueous from the other eye aspirated at the same time.

DR. CLYDE A. CLAPP: Were these cases of pure cultures of staphylococci and streptococci?

DR. BELLOWS: Most of the staphylococcic and all of the streptococcic cases reported were pure cultures.

DR. H. S. GRADLE: In what form was the penicillin used in the treatment of local conjunctival infection?

DR. BELLOWS: At first patients were treated with drops, using 2,500 units per cubic-centimeter concentration. Later, a simple U.S.P. ointment was used (penicillin concentration, 2,500 units per gram of ointment).

DR. ALBERT C. SNELL: Must these solutions be made fresh or can they be preserved?

DR. BELLOWS: The solution preferably should be fresh because the potency decreases gradually. However, some samples of penicillin keep their potency even in solution for great periods of time.

CORNEAL HEALING: ADHESIVE POWER OF AQUEOUS FIBRIN IN THE RABBIT*

PRELIMINARY REPORT

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While studying the placement of sutures in incisions in the rabbit cornea, we were attracted by the firm apposition of the wound edges before actual healing began. The sutures were not in any degree responsible for this firm approximation as attested by their removal and then their omission. An incision in the cornea proper engages no blood vessels. There is no adjacent structure nor substance adjacent to such an incision except the aqueous. It therefore remained to ascertain the quantitative and qualitative adhesive power of the aqueous for corneal wounds. The obvious difference between such strong adhesion in the rabbit and the comparatively weak response in the human suggests many interesting possibilities for the promotion of wound healing.

Recently attempts have been made to find a biologic substitute for sutures that is mechanically strong, nonirritating, and capable of complete absorption. Young and Medawar[1] in 1940 introduced the use of a fibrin coagulum as a substitute for nerve sutures. This work was extended by Tarlov and Benjamin.[2] Sano[3] developed an adhesive fraction from red blood cells that he used as a successful substitute in skin grafting. Recently Cronkite and Lozner[4] used the method of Young and Medawar in skin grafting with promising results. There are, however, no reports in the literature of any attempt to apply this procedure to replace or enhance the use of sutures in wounds of the globe.

* Read at the fourteenth scientific meeting of the Association for Research in Ophthalmology, at Chicago, June 13, 1944.

THE NATURE OF CORNEAL-WOUND HEALING

Weinstein[5] was one of the earliest to report histologic events of wound healing. He reported mitoses in the basal cells of the corneal epithelium near the wound margins one hour after injury and over the entire cornea in four hours. Ranvier[6] did not observe mitoses in the corneal epithelium until 12 hours, and considered the process of epithelial sliding over Bowman's membrane of primary importance. Weinstein's work concerning union of the substantia propria is generally accepted. He found that mitoses of the keratoblasts appeared adjacent to the wound on the second day but are not active until the fifth and sixth days. In short, the only histologic evidence of corneal healing within the first 4 hours after injury occurs in the epithelium, a structure which can offer little mechanical support in maintaining approximation of the wound edges. In the human, this process has been aided by the mechanical approximation of the wound edges by sutures.

Many observers have considered the role of fibrin in the initial phase of corneal wound healing.[7-12] Parsons[7] states, "the secondary aqueous is capable of forming a fibrinous coagulum which is important in the healing process." Gradle,[9] in his second type of corneal transplant, eliminated sutures entirely and found this method superior except that in 15 percent of the cases the transplant failed to adhere and was removed by the action of the lids. He was unable to account for this complication and discarded the method for this reason. Many who were working

with transplants at that time observed the same tendency.[13] Ascher[14] and Elschnig[15] tried to relate this failure to adhere to a serologic factor but were unsuccessful. Magitot[16] also failed to determine the cause. The action of fibrin was not considered by these authors. Busacca[17] used "coagulen," a thromboplastic anticoagulent, to facilitate wound healing. This substance was subcutaneously injected preoperatively and used locally as a hemostatic. He observed the formation of a dense coagulum which was removed before resumption of the operation. Having had one complicated case, this worker discarded the method. Weinstein[5] considered the role of fibrin unimportant.

The adhesive power of the aqueous has obviously been given very little consideration in the healing of corneal wounds in man. The approximation of such wound edges appear to depend initially on gravity. If the anterior chamber pressure is low and there is recession of the intraocular structures, the edges have a better chance to approximate than if there is a forward movement of the intraocular structures with consequent pressure against the posterior cornea.

Experiments on rabbits

Adhesive power of the normal secondary aqueous. The rabbit was considered ideally suited to this work, for the secondary aqueous forms a heavy coagulum. We assumed that this coagulum was instrumental in uniting corneal-wound edges and proceeded to test the validity of this idea.

After a number of trials, it was found that corneal transplants prepared after the method of Gradle's second type and Thomas's third type[13] were most suitable. Albino rabbits about six months old were anesthetized with basal intravenous nembutal, fortified locally with cocaine, and maintained with ether. The pupil under anesthesia was found to dilate to about 5 mm. A transplant, 4 mm. to 5 mm. in diameter, could be uniformly prepared if the operator followed the inner edge of the pupillary margin. A traction suture was inserted in the center of the corneal apex, penetrating to about one half the corneal thickness before the transplant was incised. The transplant was made with a small cataract knife by puncture and counterpuncture, the knife drawn upward and emerging about 4 mm. below the upper limbus. The hinge left below was severed with scissors. This detached section was left *in situ* and the edges carefully adjusted with a repositor. The lids, having been paralyzed by canthotomy, were allowed to remain open, and saline was dropped on the cornea at intervals. The tension necessary to rupture the wound after the proper time interval was determined in the following manner: The animal was killed and the traction suture attached to the corneal transplant was tied to one beam of an analytical balance. Water was slowly dropped into a beaker previously balanced on the opposite beam until the transplant was suddenly separated from its bed. The weight of water was the measure of the wound tension.

Normally fibrin strands form so rapidly in the rabbit aqueous that it was necessary to complete the operation within two minutes; otherwise the experiment was discarded. At the end of four hours the wound was so firmly united that the rabbit's head required support against the increasing tension on the transplant. The entire globe was seen to move forward out of the orbit as a result of the traction. Hyphemia occasionally developed just prior to the wound rupture due to the great tension on the globe. The entire anterior chamber was filled with fibrin and the fibrin strands filled the conjunctival sac and adhered to the lid margins. These latter strands were carefully

severed with scissors prior to all measurement determinations to eliminate all mechanical support except that due to the fibrin in the anterior chamber and on the wound edges. It is interesting to note that the transplant weighed approximately .003 gm. and that at the end of four hours the fibrin sealing of the wound was so strong it could support 11,000 times its own weight. The average of all readings is given in table 1 and figure 1.

TABLE 1

MEASUREMENT OF CORNEAL-WOUND TENSION

Time hours	Corneal-Wound Tension grams (average)		
	Normal	Heparin +Fibrin	Heparin
½	8.39	6.66	0.84
1	14.43	9.24	1.80
2	18.71	13.22	3.03
3	25.11	17.09	3.48
4	31.60	20.70	4.42

The effect of heparin on the aqueous fibrin. Fibrin is produced by the combination of thrombin and fibrinogen. This simplified statement is sufficient for the present discussion. Since heparin is known to interfere with the formation of fibrin, it was used for this purpose. The same determinations could then be made with minimal fibrin formation. The primary aqueous was aspirated and replaced by an equal volume of heparin (product of Lederle, containing 10 mg. of purified sodium salt of heparin in each cubic centimeter). The tensions producing wound rupture were again determined for a period of time up to four hours. In this series there was an approximate reduction of 87 percent in the tension necessary to cause wound rupture regardless of the time interval.

Addition of thrombin-fibrinogen after heparin. In order to complete the cycle of the adhesive action of normal fibrin and its reduction after the addition of heparin, its return was consummated by the injection of thrombin and fibrinogen into a heparinized aqueous. This restored the adhesive power of the aqueous as shown in table 1.

Fibrin formation in the rabbit aqueous. The formation of fibrin is not completely understood at present. Reduced to the simplest terms sufficient for this discussion, fibrin is the product of the reaction of thrombin and fibrinogen. Fibrinogen is a soluble protein found in blood plasma and various body fluids. This substance is converted into insoluble fibrin by the enzymelike action of thrombin. The clotting of blood and various body fluids depends on this process. In the absence of fibrinogen, clotting cannot occur. Normally thrombin is present in the body in an inactive form called prothrombin which requires calcium and thromboplas-

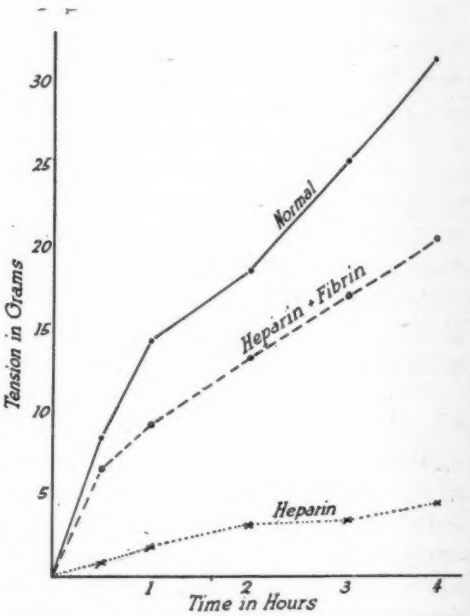

Fig. 1 (Brown and Nantz). Role of fibrin in the initial phase of corneal-wound healing in rabbits.

tin for activation. Thromboplastin is an intracellular enzymelike substance or group of substances that is locked in all body cells and is liberated by mechanical or other trauma. When liberated from the cell, thromboplastin in the presence of calcium converts prothrombin into thrombin, which, in turn, converts fibrinogen to the insoluble fibrin. Thus, when the cornea is incised the wound edges liberate thromboplastin from the cellular elements. This substance converts aqueous prothrombin into thrombin, which, in turn, converts aqueous fibrinogen into insoluble fibrin. As the aqueous filters through the wound edges, this process continues until a dense fibrin coagulum completely seals the wound in the rabbit. There is a good deal in the literature concerning the total protein content of the primary aqueous.[18–23] However, there are a few quantitative studies of the fibrinogen content of the primary aqueous in rabbit and man. Hayano[24] demonstrated fibrinogen in the aqueous of rabbits but not in cattle. He found thrombin in both. Irvin,[25] using the Denis-Ayer method, found no fibrinogen in rabbit aqueous. The method Irvin used was based on a gross clotting of the withdrawn aqueous, which was a relatively inaccurate method. Hagen[26] found that the secondary aqueous in man did not contain an increase in fibrinogen, whereas the secondary aqueous in the rabbit contained a marked increase. On this basis, he assumed that in man the secondary aqueous is derived from the vitreous but presumably not in the rabbit. Those who sought to determine the fibrinogen content of human primary aqueous report that they either found none or traces.[22, 23]

The relatively high fibrinogen content of the normal primary aqueous in rabbit can be demonstrated qualitatively by injecting a small amount of full-strength thrombin into the anterior chamber. A fibrin clot will form in the anterior chamber within a few minutes. This clot is slowly absorbed in five to six days without inducing gross ocular irritation. Quantitative determinations of fibrinogen in primary rabbit aqueous were done by the method of Quick.[27] A composite of the determinations was found to be about

TABLE 2

Fibrinogen content in Mg./100 c.c.

	Blood Plasma	Aqueous
Human	200–400	0–trace
Rabbit	200–300	39–43

20 percent of the blood plasma level or about 40 mg. per 100 c.c. (table 2). Fibrinogen content of the human aqueous produced a bare trace, which we were unable to measure.

Discussion

The profound difference between the clotting of the aqueous in the rabbit and man after a corneal incision has been noted before. To overcome this in experimental work on rabbits Friedenwald[28] used heparin and Bellows and Hchuen[29] used chlorazol-fast pink. In man no such early tendency is noted unless the anterior chamber is left intact and the aqueous is aspirated four or five times. After it has been allowed to refill, the fourth or fifth aqueous begins to clot. The tendency of the wound edges to adhere after a corneal section for cataract extraction is seen occasionally in individuals, especially if there is bleeding, but there is no general uniform tendency of such wound edges to be strongly united. This is attested by the constant search for the ideal suture for cataract extractions.

The marked difference in the fibrinogen content in the aqueous of man and rabbit undoubtedly accounts for the strong mechanical adhesion of the corneal

wound edges in the rabbit as contrasted with that in man. The application of this principle in corneal surgery in man is being studied and will be reported later.

Summary

1. The wound edges after an incision in the rabbit cornea are approximated strongly by the secondary aqueous.

2. A wound surrounding a transplant will support 11,000 times the weight of the transplant in four hours.

3. This sealing is accomplished by the fibrin produced in the aqueous.

4. The aqueous fibrin is a product of the union of thrombin from the wound edges and fibrinogen in the aqueous.

5. Heparin was injected into the anterior chamber to replace aspirated aqueous. This agent markedly decreased the adhesive power of the secondary aqueous after corneal incision.

6. The heparin was then replaced by thrombin-fibrinogen and the adhesive power was restored.

7. No comparable action occurs in man. There is no more than a trace of fibrinogen in human aqueous and a correspondingly diminished adhesive power.

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NATIONAL OPHTHALMOLOGICAL SOCIETIES IN THE UNITED STATES

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The four national ophthalmic societies in the United States, brief histories of which are herewith presented, have all originated in answer to particular demands and are fundamentally different. Whether all have a sufficient reason for an independent existence is another question and will not be discussed here. It may be pointed out that attendance at only three different times and places will cover all four meetings because the program for the Association for Research is always one day before the scientific session of the Section on Ophthalmology of the American Medical Association and held in the same city as that in which this organization meets.

On January 8, 1864, a small group of men met in New York, in the office of Dr. Henry D. Noyes, to lay plans for the formation of an ophthalmic society. It was decided to assemble the ophthalmologists of the country at the gathering of the American Medical Association in New York in that same year. This convention took place on June 7, 1864, at the New York Eye and Ear Infirmary in New York City. The association was organized under the name of the American Ophthalmological Society, and a constitution was adopted. It was stated that "the purpose of this society shall be for the advancement of the ophthalmic science and art." This society met annually thereafter and many new members were added to the original 19.

The American Ophthalmological Society was the first of the American ophthalmic associations to be organized. It originated in the manner of a club and has always retained something of that atmosphere. Membership is by invitation and is limited to 225. Because it was started by distinguished and far-seeing physicians and has been carried on by many of the most enlightened ophthalmologists of this country and of Canada, it has retained its preëminence among special societies. Obviously, however, not all of the outstanding eye doctors of the United States can be included in such a small membership. It, therefore, is not fully representative of ophthalmology in America. Because of its brilliant enrollment many classical original contributions have been presented before it. A delightful social aspect has always surrounded its meetings, which are oftenest held at Hot Springs in the beautiful mountains of Virginia. Every joint committee of ophthalmology includes representation from this society as such, and among its members have been many of the leaders of ophthalmic thought in America.

The Section on Ophthalmology of the American Medical Association was formed in 1877, 30 years after the organization of the parent body. This, the sixth section of the American Medical Association, originated as a section for ophthalmology, otology, and laryngology, and continued thus until 1888, when the Section on Ophthalmology became a separate body.

The first chairman of the combined section was Herman Knapp of New York. The first meeting was held in Atlanta, Georgia, on May 6, 1879. The officers consist of a chairman, a vice-chairman, and a secretary. The Section appoints a representative to the House of

* From the Department of Ophthalmology, Washington University, and the Oscar Johnson Institute.

Delegates of the American Medical Association for a two-year period, who officially represents the Section. Meetings are held annually for three half-day sessions at which scientific papers are read and discussed.

The ophthalmic section of the American Medical Association is the official representative of organized medicine in the United States. It is here that matters concerning administration and legislation pertinent to the specialty are discussed. Relationships with other organizations concerned with vision are here defined. Actions taken by this body are presented to the administrative section of the American Medical Association by the delegate from the Section, and are there accepted or rejected.

One of the great advantages of the meetings of the American Medical Association is the opportunity there available to meet with doctors in other specialties and to hear the best papers in branches other than one's own. Here, too, are the greatest number and variety of exhibits. Walking through the miles of aisles between the displays of thousands of manufacturers whose products are of interest to physicians, is in itself a liberal education.

The Association for Research in Ophthalmology, companion to the Section, was organized about 20 years ago for the purpose of providing an opportunity for the man engaged in research to present his work in detail to a sympathetic audience. The papers often have no obvious clinical application and are of interest only to the scientifically minded. The membership is small, and the attendance seldom more than 100. There is no discussion except for replies to questions from the floor. This kind of scientific paper has seldom found a welcome place on the program of any other national society, too many of the members of which do not enjoy hearing discussions of this type of research. Furthermore, such papers occupy too much time for a general program. The Association for Research on the other hand, being made up of those alone who are interested, has proved a stimulating outlet for laboratory workers.

In 1896 there originated a society that later became the American Academy of Ophthalmology and Otolarygology. Certain ophthalmologists and otolaryngologists, practicing west of the Mississippi, held an organization meeting in Kansas Cty. Dr. Adolph Alt of Saint Louis was elected first president. This society was there named the Western Ophthalmological, Otological, Laryngological, and Rhinological Association. For some years western and southwestern members were in the great majority, but thereafter the popularity of the society waxed and many from other regions joined the group. It was then, and has always remained, a society with the special purpose of appealing to the younger men of the nation.

In 1910, at a meeting in Cincinnati, the name was changed from the Western Ophthalmological, Otological, Laryngological, and Rhinological Association to the American Academy of Ophthalmology and Otolaryngology.

Dr. Secord Large, comptroller for many years, suggested the idea of postgraduate instruction courses during the meetings. In 1921, at the meeting in Philadelphia, the first section of the Postgraduate Instructions was announced as a part of the annual program. It took the present form in 1927. There were 37 demonstrators at the first courses in 1921. Motion pictures illustrative of operative and other procedures were first shown in a distinct unit in 1932. Prior to this time motion pictures were used only in conjunction with the presentation of papers.

The American Academy of Ophthalmology and Otolaryngology has instruc-

tion for its basis. Its main purpose is to disseminate as much pertinent information to ophthalmologists and otolaryngologists as can be condensed into a five-day program. Work is the keynote of these five days.

Unlike the American Ophthalmological Society and the Section on Ophthalmology, meetings are held all day long and every evening except for two evenings of entertainment. The outstanding feature is the courses of instruction. These are each from an hour to an hour and a half in length and are presented by an expert in the particular subject. Over 100 courses have been given each year for a number of years. Four mornings are usually occupied by these courses. Almost all are crowded by members and guests. Most of the instruction is to small groups of from 15 to 20. As soon as the young ophthalmologist has been certificated by the American Board of Ophthalmology, he is eligible to membership in the Academy, and most of these young men join this society.

The first available list of members appeared in the bound volume of the Transactions of the American Academy of Ophthalmology and Otolaryngology for 1903. At that time there were 169 members. This number has now increased to 3,526.

The latest undertaking of the Academy has been the establishment of correspondence courses. These immediately became popular and annually serve more than 300 members or ophthalmologists and otolaryngologists not yet eligible to membership. They are designed especially for the ophthalmic and otolaryngologic residents in hospitals in which systematic instruction is not given. Reading assignments are made, and are followed by written quizzes which are corrected by a staff of volunteer workers from the Academy membership. The value that these courses have already proved is very great, and it is anticipated that after the war their importance will be far greater.

In 1913 the three then extant national ophthalmological associations appointed a joint committee for the purpose of forming an examining board for ophthalmology. Resulting from their efforts, the American Board of Ophthalmology, originally called the American Board of Ophthalmic Examinations, was formed.

At the outset nine members, three from each of the then functioning national societies, formed the Board. Later this number was increased to 12, 4 from each society. The organization meeting took place in Washington, D.C., on May 8, 1916.

This Board was the first of many specialty boards modelled after it, which have assumed an increasing importance in medical practice in the United States. A certificate from the American Board of Ophthalmology is indicative of efficiency in the medical and surgical care of the eye. Most medical schools require the certificate as a prerequisite for appointment to advanced instructorship. Each year an increasing number of men apply for these examinations. Over 2,000 ophthalmologists have already been certificated. A great stimulus was given by the special recognition granted by the Armed Forces to those certificated in ophthalmology. As a method of encouraging young men to better things in the practice of medicine, these boards have proved of inestimable value.

The examination usually consists in the submission of case reports, a written and an oral test occupying two days. Background, character, and ethics of the candidate are carefully considered. Such boards as these may well serve as models for other countries, but they must be impartially administered and entirely devoid of politics.

The foregoing presents a brief résumé

of our national ophthalmic organizations. In any complete discussion of ophthalmological societies in the United States mention should be made of the Pacific Coast Oto-Ophthalmological Society, which is an active organization in the western states functioning much as the American Academy of Ophthalmology and Otolaryngology, and of the specialty section of the Southern Medical Association that has a wide appeal among the doctors of the south. Recently the eye section of the American College of Surgeons has become active and is unique in offering a three-day surgical program of considerable variety to its members.

Perhaps there are too many ophthalmological societies. But few attempt to attend them all, and their different characteristics permit each man to satisfy his own scientific appetite.

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TENOTOMY OF THE RECTUS MUSCLES IN GLAUCOMA*

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The causes of the initial rise of intraocular pressure in cases of chronic simple glaucoma are not well understood. Practically all our information regarding this disease and its pathology is of the terminal stages. In the fully developed case of glaucoma there are so many secondary changes that we have little help regarding the original causes. Most of the surgery for glaucoma is designed to reduce intraocular pressure by increasing the drainage of aqueous, so that most of our attention has been directed to this phase of the problem. It has been repeatedly demonstrated, however, that the peripheral anterior synechiae which impede the outflow of aqueous develop late and are not the initial cause of the increased tension, so there are undoubtedly other factors. While investigating some of these, we studied the effects of changing the arterial supply to the eye.

The intraocular pressure depends largely on the blood flow, as after death the tension rapidly falls. Temporary reduction of the arterial supply to the eye can be produced by the action of adrenalin[1, 2] on the blood vessels by retrobulbar and subconjunctival injection. In cases of glaucoma, this causes a temporary reduction of intraocular pressure, apparently due to arterial constriction.

We considered various methods for more effective curtailment of the arterial supply, and one of us (R. K. L.) suggested tenotomizing the four recti. We were unaware that this had been tried before.[3] This operation releases the muscular pull of the recti and cuts off the anterior ciliary arteries that pass through the muscles. These vessels pass over the insertion of the tendons and penetrate the eyeball about 3 or 4 mm. from the limbus. They then anastomose with the long posterior ciliary arteries to form the major arterial circle of the iris, which supplies the ciliary body and iris. Probably the larger portion of this blood supply arises from the anterior ciliary vessels. After tenotomy of the recti, sufficient blood is apparently supplied by the long posterior arteries to the anterior part of the eye to prevent harmful effects. At all events, we did not observe any changes due to ischemia.

Studies have been made on the effect of the pull of the extraocular muscles on intraocular pressure. Parsons[4] commented

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* From the Ophthalmological Service of Montefiore Hospital.

on the effects of curare, which paralyzes the extraocular muscles and lowers tension. Schoenberg[5] tenotomized the eyes of rabbits and found that tension was lowered for a few days. Levinson[6] found that stimulation of the extraocular muscles raised intraocular pressure. None of these studies were done on glaucomatous eyes.

Tenotomy of the four recti produces exophthalmos, which is greatest immediately after operation but which diminishes somewhat in the following few weeks. The final amount of exophthalmos in our cases was 4 mm. in one and 3 mm. in the other case.

The muscles do not reattach in exactly the same relative position they held before operation, but do so with some irregularity, so that the position of the eyeball is turned, and, as a result there is a vertical or lateral tropia of 10 to 20 prism diopters. In our cases the eyes were blind, so there were no disturbing effects.

Within a week after tenotomy, motion of the eyeball is reëstablished as the muscles become attached to the eyeball. The final range of motion is limited to approximately half of the normal.

The effect of tenotomy on the intraocular pressure is a substantial drop in pressure, which lasts about six weeks and is followed by a subsequent rise. This rise in pressure is possibly due to the development of new arterial channels, or dilatation of the old ones.

We performed two operations of this type. Both were in cases of absolute glaucoma in eyes that were blind and painful. The usual procedure of enucleation was offered the patients, but was refused in favor of any other procedure which would spare the eye.

In the first case there was a reduction of tension from over 70 mm. Hg (Schiötz) to 50 mm. This lasted six weeks, and was followed by a gradual rise to 60 mm.; after three months the tension had returned to 70 mm.

In the second case, the tension could not be taken before operation, as the cornea was very irregular owing to extensive vesiculation, but every one who saw the patient agreed that the eye was stony hard. The cornea was gray and clouded so that the iris could not be seen through it. After operation, the corneal vesicles healed and the corneal surface became quite smooth. It had numerous opacities, but became transparent enough to permit a view of the iris. Tension could then be taken on this cornea, and was found to have fallen to 34 mm., at about which level it stayed for over six weeks, then rose to 40 mm. Hg, where it has stayed for the past three months. The patient was much relieved by this operation.

Case 1. R. K., a widow, aged 72 years. Diagnosis: Papillary carcinoma of the bladder with metastases, hypertension, arteriosclerotic heart disease, and bilateral glaucoma.

The patient was known to have had glaucoma in both eyes for 10 years. Seven years ago, at another hospital, iridectomy and cataract extraction were performed on the right eye. She was unhappy about the result of the operations, and refused surgery for the left eye, although it had been repeatedly urged. The left eye became blind about a year prior to admission. Pain had been recurring in it at intervals, but was very severe for three weeks before operation.

In the right eye, there was an operative coloboma of the iris superiorly. The pupil was drawn up, and there was a delicate secondary membrane. The fundus was seen through a haze. The disc was deeply excavated, the vessels dipping in at its edge. The arteries were narrowed, and indented the veins they crossed. There were no hemorrhages nor exudates. Vision with glasses was 5/200. The field of

vision was difficult to study as the vision and fixation were poor, but it was markedly contracted. Tension fluctuated between 22 and 34 mm. Hg.

The left eye was painful and congested. The cornea was steamy, with a small ulceration in the center. The eye was absolutely blind. Tension was over 70 mm., and stayed there despite all medication.

On June 24, 1943, the four recti of the left eye were tenotomized. There was moderate reaction postoperatively, but the pain was relieved soon after operation. Tension fell to 50 mm., and stayed at about that level for six weeks, then gradually rose to 60 mm., and a month later to 70 mm.

There was an exophthalmos of 3 mm., with a slight hypertropia.

Case 2. L. S., a housewife, aged 51 years, had had a history of diabetes mellitus for 21 years. Circulatory disturbances affected her extremities, so that a year prior to admission, a left mid-thigh amputation was done, and recently the right third toe had been removed.

In 1938, at another hospital, she had bilateral cataract extractions after preliminary iridectomies. This operation was followed by bilateral glaucoma that was thought to be secondary.

The right eye had an operative coloboma of the iris superiorly. The pillars of the iris were drawn upward into the wound. There was a secondary membrane through which only a fundus reflex could be seen, but no details. Vision with glasses was limited to counting fingers at 3 feet. Tension fluctuated between 20 and 30 mm. Hg, while the eye was under the influence of pilocarpine.

The left eye was painful and very congested. The cornea was gray and irregular, with many vesicles, and so clouded that it was opaque. The eye was stony hard, and tension could not be reduced by medication.

On November 15, 1943, an operation on the left eye was performed, consisting of tenotomy of the four recti. The local reaction was moderate, and the patient was relieved of pain and very grateful for the procedure. The corneal blebs flattened and the cornea became somewhat transparent so that the iris was visible, and a vague fundus reflex was obtained. Tension dropped to 34 mm. Hg, at which level it stayed for over six weeks, then gradually rose to 40 mm. It has stayed at this level for the past three months.

The left eye is in a slightly divergent position, with 4 mm. of exophthalmos, and a limited range of motion in all fields.

After we had performed these operations, it was discovered that the same procedure had been undertaken by Sapir[3] in Russia. He had performed it in 43 cases of glaucoma of various types; acute, chronic, and absolute, primary and secondary. In all but three the tension fell 12 to 48 mm.; the maximum lowering occurred two to five days after operation. After a few months, tension returned to the preoperative level. Vision improved in some. His patients developed exophthalmos and a changed position of the globe. Those that had vision had diplopia. To avoid this, he tried cutting the central portion of the tendons only, and left 1 mm. attached on each side. However, this lessened the effect of the operation. He also diminished the diplopia as well as the exophthalmos by only tenotomizing two opposing muscles, such as the two laterals or the two verticals, but this also diminished the effect on the intraocular pressure. Partial effects were obtained by tying off the recti, or cauterizing them, thus closing the anterior ciliary arteries. He concluded that this operation is effective in obtaining temporary relief, and commented on its usefulness in a case of glaucoma associated with ulcerative blepharitis that would

have made intraocular operation dangerous. Our experience in the cases we have presented confirms the findings of Sapir.

Summary and Conclusions

An interesting approach to the study of glaucoma is offered by tenotomizing the four rectus muscles and curtailing the arterial supply to the eye. This procedure is followed by a temporary lowering of intraocular pressure. It also produces an exophthalmos of 3 to 4 mm. and a changed position of the globe.

The fall in tension is due partly to the release of the pull of the recti on the eyeball and partly to the interruption of the anterior ciliary arteries which pass through the muscles into the eyeball. After about six weeks, there is a return of higher pressure, probably due to the reëstablishment of the circulation.

This is not offered as a definitive operative procedure, but as a method for further study. The operation may be useful in the blind eyes of absolute glaucoma, but is not advisable for an eye with vision.

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THE ASSOCIATION BETWEEN RETINOPATHIES AND ENCEPHALOPATHIES IN THE COMMON CARDIO-VASCULO-RENAL AFFECTIONS*

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That a close relationship must of necessity exist between the eye and the brain, due to their common inception and blood supply, cannot be denied. However, the many factors that produce changes and the reaction to them are somewhat different in the two organs. For instance, the greater size of some of the vessels of the brain, having no counterpart in the eye, may cause them to become involved by certain conditions that rarely affect the retinal vessels. Investigators who endeavored to ascertain the value of the fundus as a diagnostic means of determining the condition of the blood vessels of the brain, the kidneys, or the general system, after having compared their ophthalmoscopic observations with the pathologist's findings at the autopsy, report quite different conclusions. However, we must not lose sight of the fact that large and small vessels and capillaries are affected differently, even in the same tissue and in the same area. If this is remembered, one can state with less chance of error, upon observing the fundus of the eye, that the brain or the parenchyma of the kidney may be involved, at least in part, in a similar manner. Those affections which primarily involve the same caliber of vessels in the retina, the brain, and the kidney behave in a remarkably similar manner.

ARTERIOSCLEROSIS

The basis for most of the vascular changes in the eye and brain is a sclerosis of the blood vessels. There are many classifications of sclerosis, but the chief and the common types are: (1) the atherosclerotic changes of the arteries, and those conditions resulting from (2) hypertension, and (3) arteriolar sclerosis.

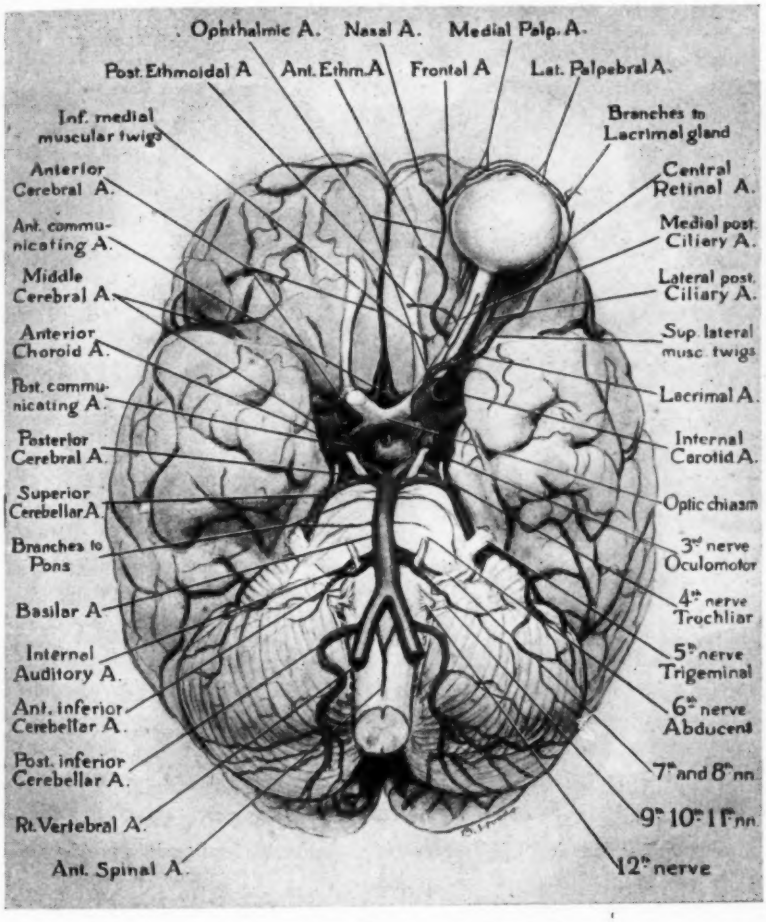
Atherosclerosis is primarily a fibrous and hyaline degeneration of the muscular media. The intima may be affected secondarily by fatty deposits and endothelial-cell proliferation. This may lead to thrombosis and occlusion of the lumen of the vessel. In the eye the arteries show an increased light reflex, moderate arteriovenous constriction, and some beading or white sheathing of the vessels near the disc. This is a very common form of sclerosis and is one of the senile changes that occurs throughout the body, although it is not necessarily distributed evenly as to its severity. The moderate form is symptomless and is independent of increased blood pressure (fig. 1).

Hypertension of the essential or benign type without arteriosclerosis is entirely possible. It may be symptomless, especially as regards vision. It may be due to an infection, a toxin or poison, or to a metabolic or endocrine disturbance which produces a tonic contraction of the vessel walls and which, if eliminated in time, may be of no consequence. If however, the causative agent is allowed to remain and the increased tension continues, an arteriosclerosis may develop which, owing to the influence of the increased blood pressure, may produce changes in the walls of the blood vessels and ultimately affect the tissues supplied by these vessels. In the eye the arterial network then becomes constricted. The larger arteries are

* Candidate's thesis for membership in the American Ophthalmological Society accepted by the Committee on Theses, June, 1943.

mere straight threads branching at acute angles, and the small vessels are invisible (fig. 2). Sheathing of the vessels appears. Later, exudates and hemorrhages may produce an arteriosclerotic retinosis.

Arteriolar sclerosis, the third type, affects retinal arteries of all sizes but more especially the smaller arterioles whose visibility and tortuosity are increased (fig. 3). The musculature of the larger vessels, the subendothelium, and the elastic tissue are affected with constriction of the lumen to the point of obliteration. At first, however, in the larger vessels, irregular tortuosity develops, with widened light reflexes, arteriovenous constriction, and sheathing of the vessels. In the arterioles and capillaries the walls are thickened, and the lumen may close altogether. Later, hemorrhages and exudates, and finallly a papilledema, with edema of the retina, may appear, especially if a toxemia is present. At this stage the arteries are narrowed, especially if the condition is superimposed upon a benign or essential hypertension that has existed for some time. Occasionally the toxic manifestations of edema appear in a normal fundus, as in acute toxemia of pregnancy and in



Arteries of the brain and eye. Basal view.

Figs. 1-10 (Lyle). Retinopathies.

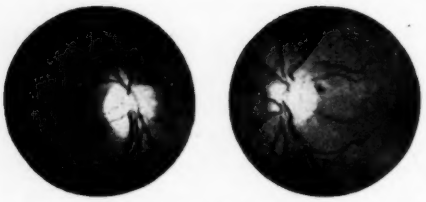


Fig. 1. Early retinal arteriosclerosis.

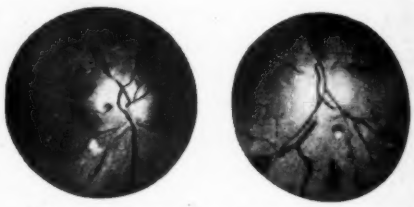


Fig. 2. Arteriosclerotic retinosis with hypertension.

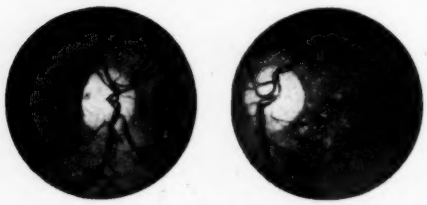


Fig. 3. Arteriolar sclerosis.

Fig. 4. Arteriosclerotic retinosis.

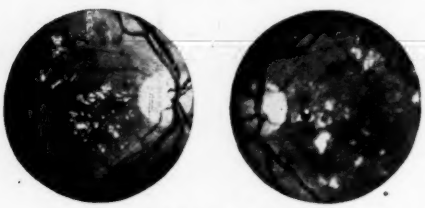


Fig. 5. Diabetic retinosis.

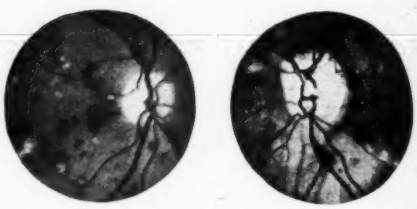


Fig. 6. Arteriosclerotic retinosis with marked hemorrhages.

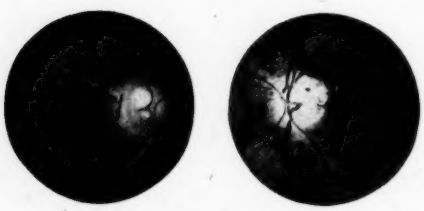


Fig. 7. Diabetic retinosis with marked hemorrhages.

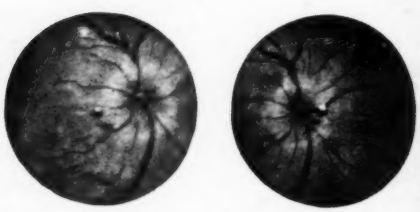


Fig. 8. Malignant hypertension with nephrosclerosis.

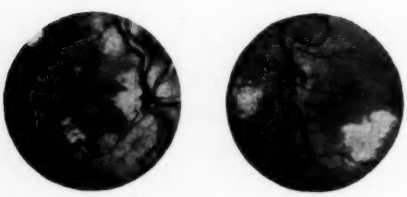


Fig. 9. Retinopathy from glomerulonephritis.

Fig. 10. Malignant hypertension with edema of retina and papilla.

lead poisoning. If toxic disturbances are added to arteriosclerosis and hypertension, the retinopathies of arteriosclerotic malignant hypertension, renal and diabetic affections, are produced.

Of these conditions, the arteriosclerotic (fig. 4) and the diabetic (fig. 5) types are usually free from edema, the vessels show advanced arteriosclerotic changes, and the hemorrhages are generally small. In some cases, however, both in the arteriosclerotic (fig. 6) and in the hemorrhagic type of diabetes (fig. 7), hemorrhages may be relatively large and profuse. The exudates are usually small, and present a hard appearance, with sharp edges. Many observers believe that diabetic retinosis is merely an arteriosclerotic retinosis occurring in a diabetic. This is borne out by the fact that retinal changes are seldom found in the juvenile diabetic and are most frequent in the diabetic with arteriosclerosis. There is no doubt but that diabetes predisposes to arteriosclerosis and thrombosis and that arteriosclerosis is more common in diabetes (fig. 7). Every observer who has studied the subject has been impressed by the fact that a pure isolated retinopathy is quite rare. The retinopathy is a combination of arteriosclerosis, hypertension, and toxemia of renal, diabetic, or other sources. One may, at best, determine the principal, primary, or dominant factor.

The retinopathies of malignant hypertension (fig. 8) with nephrosclerosis and glomerulonephritis (fig. 9) are characterized by edema of the retina and papilla (fig. 10) with soft, fluffy exudates and hemorrhages, which may be extensive, and narrow, attenuated arteries. Charts 1 and 2 list a series of such cases, together with their cardio-vasculo-renal conditions.

Arteriosclerosis in the brain, as in the retina, commonly produces atherosclerosis and arteriolosclerosis. Atheromatous vascular sclerosis occurs frequently in the cerebral arteries. It is found almost constantly in the aged. In patients of advanced years difficulty is experienced in determining whether the sclerosis is a true arteriosclerosis or a senile degeneration. However, aging of the vessels is surely one of the causes of arteriosclerosis together with degenerative changes produced by toxins, infections, and the like. The common findings in cerebral atherosclerosis are hyalinization of the arterial walls, proliferation of the intima, fatty degeneration and calcification, narrowing or widening of the lumen, endarteritis or periarteritis, and splitting or increase of elasticity. In the senile the elasticity is lost, and connective and glial tissue develops evenly, or unevenly in the form of plaques.

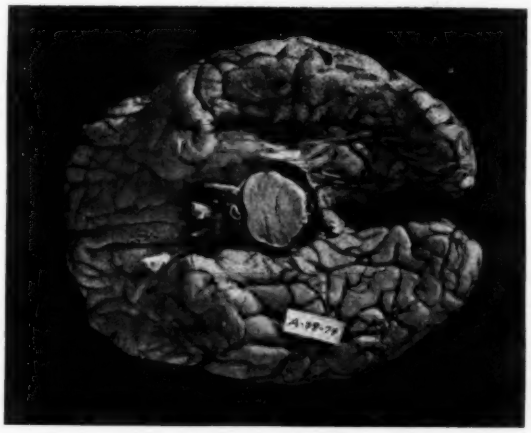


Fig. 11 (Lyle). Thrombosis of left posterior cerebral artery and marked arteriosclerosis of vessels at base of brain.

Figure 11 (A 39—74) shows the base of the brain of a man, aged 68 years, who was found to have a marked retinal arteriosclerosis and a right homonymous hemianopia. His blood pressure was 142/97. The vessels at the base of the brain showed marked atheromatous changes. A thrombosis of the left pos-

CHART 1

AUTOPSIES PERFORMED ON HYPERTENSIVE CASES.—PRIMARILY SCLEROTIC—SECONDARILY NEPHRITIC

Case—Age	*Retina*	*Blood Pressure*	*Heart (Aorta)*	*Kidneys*	*Urine*
1. F. C. (31–525) m–	Arteriosclerosis, marked. Retinal edema. Papilledema—slight.	Not available	Myocardial fibrosis and edema. Coronary arteriosclerosis.	Arteriolar nephrosclerosis advanced.	Alb.+
2. H. D. (32–124) m–	Arteriolar sclerosis. Old scars and hemorrhages. Papilledema.	190/130	Myocardial fibrosis. Arteriosclerosis—early aortitis.	Arterio- and arteriolar nephrosclerosis.	Alb.+++
3. A. H. (32–543) m–	Arteriolar sclerosis. Retinal exudates numerous. Papilledema marked.	210/38 also 176/136 (earlier)	Myocardial fibrosis. Atherosclerosis. General arteriosclerosis.	Arterio-nephrosclerosis advanced	Alb.++++
4. M. S. (32–569) m–	Arteriolar sclerosis, marked. Retinal hemorrhages and scars numerous. No papilledema.	210/140	Cardiac hypertrophy and dilatation.	Arterio-nephrosclerosis. Subacute glomerulonephritis.	..
5. T. M. (32–129) m–	Arteriolar sclerosis, marked. Retinal exudates. Papilledema of left eye	..	Myocardial hypertrophy. Edema. General arteriosclerosis.	Toxic nephrosis extreme. Hydronephrosis with cyst.	Sugar trace
6. W. K. (32–482) m–	Arteriolar sclerosis, marked. Many hemorrhages and exudates. Papilledema.	230/180	Hypertrophy and dilatation. Edema. General arteriosclerosis.	Arteriolar nephrosclerosis. Terminal acute pyelonephritis.	Alb.+++ Sugar trace
7. J. F. (30–609) m–	Marked sclerosis. Papilledema.	Not obtained	Myocardial edema and fibrosis. Generalized arteriosclerosis.	Arterio-nephrosclerosis.	..
8. C. B. (31–413) m–	Slight papilledema.	..	Myocardial fibrosis. General arteriosclerosis.	Arterio- and arteriolar sclerosis. Advanced.	Alb.++ Blood urea 75.
9. M. A. (31–68) f–24	Arteriolar sclerosis, marked. Retinal hemorrhages and exudates—numerous, old and recent.	220/130	Toxic myocardiosis. Atherosclerosis of aorta.	Arteriolar nephrosclerosis, marked, far advanced. Toxic nephrosis.	Alb.++++
10. G. McC. (32–466) m–	Arteriolar sclerosis, marked. Papilla pale and indistinct.	130/70	Myocardial fibrosis. Atherosclerosis, coronary. Generalized arteriosclerosis.	Arteriolar nephrosclerosis.	Alb. Neg. Sugar Neg.
11. C. G. (32–323) f–55	No hemorrhages or exudates. Discs very white. Papilledema.	180/100	Diffuse myocardial degeneration and fibrosis and hypertrophy. Advanced coronary and general arteriosclerosis.	Arterio- and arteriolar nephrosclerosis.	Alb. trace
12. G. W. (31–236) f–37	Arteriolar sclerosis, marked. Retinal exudates. No hemorrhages. Papilledema.	240/170	Toxic myocardosis. Hypertensive heart. Aneurysm of aorta. Generalized arteriosclerosis.	Arterio-nephrosclerosis (early)	Alb.+++
13. A. C. (31–336) f–	Arteriolar sclerosis, marked. Many hemorrhages and exudates.	..	Generalized arteriosclerosis.	Arterio- and arteriolar nephrosclerosis.	..
14. S. J. (32–663) m–	Arteriolar sclerosis, marked. Small diffuse hemorrhages.	..	Hypertensive heart. Myocardial degeneration. Generalized arteriosclerosis. Coronary sclerosis.	Arterio- and arteriolar nephrosclerosis.	Alb.+
15. M.S. (34–105) f–63	Arteriolar sclerosis.	200/85	Heart block. Advanced myocardial degeneration and dilatation. Aortic arteriosclerosis.	..	Alb.+
16. F. O'R. (34–86) m–53	Papilledema (bilateral).	..	Myocardial fibrosis. Atherosclerosis of the aorta.	Chronic passive congestion.	Sugar+
17. W. G. (34–99) –74	Arteriolar sclerosis (marked).	270/140	Myocardial hypertrophy and fibrosis. Arteriosclerosis.	Chronic passive congestion.	..
18. T. D. (32–78) m–48	Advanced hemorrhagic and exudative retinitis. Papilledema.	240/150	Hypertrophy; myocardial. Atherosclerosis coronary.	Chronic glomerulonephrosis. Marked arteriolar nephrosclerosis.	Alb.+++
19. F. E. (33–52) m–60	Arteriolar sclerosis.	190/110	Atherosclerosis of the aorta and coronary. General vascular sclerosis.	Chronic passive congestion.	Alb.+

CHART 1

AUTOPSIES PERFORMED ON HYPERTENSIVE CASES.—PRIMARILY SCLEROTIC—SECONDARILY NEPHRITIC

Meninges	*Vessels*	*Convolutions*	*Sutures*	*Appearance*	*Weight*	*Spinal Pressure*
Thick at base.	Markedly sclerotic. Atheromatous.	Flat.	Narrow.	General arteriosclerosis. Soft and flabby. Edema.	1,440	..
Dura thick. Pia edematous.	Appear normal.	Flat.	Narrow.	Pale—edematous.	..	..
Normal.	Slight congestion. No plaques.	Very flat.	Hardly noticeable.	Arteriosclerosis, edema and congestion.	1,635 g.	26 cm.
Normal.	Moderate congestion. Permanent vascular markings.	Moderately flat.	Narrow.	Edema and congestion. Marked. Hemorrhage occipital lobe; softening.	1,330 g.	Nothing unusual.
Pia thick. Chronic leptomeningitis.	Engorged.	..	..	Edema. Early internal hydrocephalus.	..	Increased subarachnoid fluid especially at base.
No head permission			..	..	..	..
Normal.	Injected. Subarachnoid and right frontal hemorrhages.	Flat.	Narrow.	Hemorrhage and edema.	1,175	..
Normal.	Engorged.	..	..	Edema.	1,325	..
No head permission					1,240	
Normal.	Atheromatous plaques in Circle of Willis. Vessels not engorged.	Narrowed.	Widened.	Encephalitis in frontal lobe. Right ventricular nucleus soft.	..	Increased subarachnoid fluid.
No head permission						No tap.
No head permission						34 cm.
Dura adherent. Pia thick.	General sclerosis and hyalinization all vessels.	..	Thrombosis, middle cerebral artery	Multiple areas of degeneration. Encephalomalacia.	..	..
Dura, petechial hemorrhages. Marked subarchnoid fluid.	Arteriosclerosis, marked.	Atrophic.	..	Cortical atrophy and general arteriosclerosis.	1,030	..
Nothing abnormal.	Slightly congested.	Flattening.	Narrowing.	Edema.	1,135	No tap.
Pia thick at base.	Cerebral arteriosclerosis, blood subarachnoid.	Flattened. Softening at base.	Narrowed.	Edema. Encephalomalacia. Rel. hydrocephalus.	1,550	..
Chronic leptomeningitis.	Hemorrhage into pons and medulla.	Flattening.	Narrowed.	Softening and hemorrhage at junction of pons and medulla.	1,335	No tap.
Negative.	Cerebral hemorrhages.	Flattened. Marked.	Narrowed.	Softening basal nuclei, also hemorrhage.	..	..
Pia thickened.	Cerebral arteriosclerosis. Atherosclerosis.	Flattened.	..	Congestion and edema. Softening right frontal and parietal lobes.	1,300	..

CHART 1—*Continued*

Case—Age	*Retina*	*Blood Pressure*	*Heart (Aorta)*	*Kidneys*	*Urine*
20. L. E. (33–63) m–57	Arteriolar sclerosis.	190/50	Myocardial hypertrophy fibrosis and dilatation. Aortic atherosclerosis.	Chronic passive congestion.	..
22. C. E. (30–204) m–47	Retinal exudates (numerous). Papilla blurred.	210/132	Interstitial edema of myocardium. Syphilitic aortitis.	Arteriolar nephrosclerosis (far advanced).	Alb.++ U.N. 24 43 30
23. D. B. (30–177) f–50	Retinal exudates (numerous). Papilla blurred.	134/78	Toxic myocarditis. Moderate sclerosis.	Arteriolar nephrosclerosis and toxic nephrosis.	Alb.– –
24. H. K. (30–218) f–42	Arteriosclerosis advanced. Retinal exudates and hemorrhages. Papilledema.	150/100	Chronic sclerotic valvular endocarditis. Toxic myocarditis. Marked coronary sclerosis.	Arterio- and arertiolar nephrosclerosis. Far advanced.	Alb.++ U.N. 86 to 1[illegible]
25. M. T. (29–623) f–45	Retinal exudates and hemorrhages. Papilledema.	300/200	Diffuse myocardial fibrosis. Cardial hypertrophy. Early aortic atherosclerosis.	Arterio- and arteriolar nephrosclerosis. advanced.	Alb.++++
26. L. B. (28–332) f–46	Papilledema.	234/128	Subacute fibrous pericarditis.	Arterio- and arteriolar nephrosclerosis. Far advanced.	Alb.++++
27. H. H. (29–555) m–59	Arteriolar sclerosis. Retinal hemorrhages. Papilla "obscured." Conjugate deviation to right.	..	Myocardial degeneration with fibrosis and hypertrophy. Atherosclerosis of aorta.	Arterio- and arteriolar nephrosclerosis, chronic.	..
28. D. F. (30–28) m–65	Aerteriolar sclerosis. Papilledema.	210/96	Myocarditis (chronic). Pericarditis (chronic). General arteriosclerosis.	Arteriolar nephrosclerosis (advanced).	Alb.+
29. U. K. (29–229) m–	Arteriolar sclerosis. Retinal hemorrhages. Papilledema.	160/55	Myocardial degeneration. Atheromatous aortic changes.	Arteriolar nephrosclerosis.	Negative
30. M.J. (29–55) m–40	Arteriolar sclerosis. Many old retinal scars. Papilledema marked. Conv. dev.	300/180	Diffuse mycardial fibrosis. Coronary sclerosis. Generalized arteriosclerosis.	Arteriolar nephrosclerosis (advanced).	..
31. L. G. (29–76) f–39	Many retinal exudates. Papilledema.	300/165 to 290/165	Myocardial degeneration. Interstitial cardiac edema.	Arterio- and arteriolar nephrosclerosis, chronic—marked.	..
32. H. L. (M.9103) m–52	Arteriolar sclerosis. Exudates—few, small. Papilledema.	..	Fibrosis myocarditis. Hypertension and dilatation. Sclerosis and dilatation of aorta.	Arteriolar nephrosclerosis, chronic and far advanced.	Alb.++
33. S. D. (29–404) f–31	Five months pregnancy. Papilledema.	98/60	Edema of myocardium.	Not remarkable.	Alb.–
34. R. G. (30–26) m–30	Arteriolar sclerosis. Retinal hemorrhages. Malignant hypertension. Papilledema.	204/146	Fibrinous pericarditis.	Advanced arteriolar nephrosclerosis. Glomerulo-nephritis, chronic.	Alb.+++
35. U. N. (26–310 m–	Arteriolar sclerosis. Papilledema.	210/120	Chronic myocardial hypertrophy fibrous degeneration.	Nephrosclerosis, chronic vascular nephrosis.	..
36. C. M. (27–177) f–54	Eyes turn upward. Papilledema.	None recorded.	Chronic myocarditis, coronary sclerosis.	Arterio-nephrosclerosis (early). Toxic nephrosis	Alb.++++
37. M. P. (26–404) f–80	Retinal hemorrhages. Conjugate deviation to right.	Not recorded.	Myocardia fibrosis. Chronic endocarditis.	Chronic vascular nephrosis.	Not recorded.
38. U. C. (27–140) m–45	Arteriolar sclerosis. No hemorrhages or exudates. Papilledema.	210/130	No record.	..	Negative.
39. M. L. (27–156) f–60	Arteriolar sclerosis. Retinal edema. Papilledema. Conv. dev. to left.	290/140	Myocarditis. Myocardial insufficiency. Atheroma of aorta.	Arteriolar nephrosclerosis (advanced).	Alb.+
40. A. W. (28–425) f–32	Retinal hemorrhages. Papilledema.	172/95	Congestion.	Slight arteriosclerosis of kidneys.	Alb.+ Sugar+++
41. W. J. (M–25–12) m–	Arteriosclerosis. Retinitis. Vessels markedly sclerotic. Papilledema.	190/118 to 235/150	Hypertrophy. Aortic thickening. General arteriosclerosis.	Chronic vascular nephritis. Renal edema.	Alb.+++ U.N. 50

CHART 1—*Continued*

Meninges	*Vessels*	*Convolutions*	*Sutures*	*Appearance*	*Weight*	*Spinal Pressure*
Negative.	Thickened. Many plaques.	..	..	Congestion.	1,360	..
No head permission			..	..	..	..
Appear normal.	Moderate congestion. Basal atheromatous changes.	Moderately flattened.	Narrowed.	Edema. Congestion moderate.	..	..
Not remarkable.	Slight atheromatous changes.	Flattened.	Narrowed.	..	..	..
No head permission			..	..	..	Negative.
No head permission			..	..	..	..
Normal.	Cerebral hemorrhage. Cerebral arteriosclerosis.	Flattened.	Narrowed.	Edema. Intraventricular hemorrhage.	..	No pressure.
No head permission			..	..	..	..
	Subdural and pial hemorrhage. Cerebral arteriosclerosis.	Narrowed.	Narrowed.	Edema and softening.	1,350	22 cm. Bloody.
..	Hemorrhage into brain and meninges, multiple.	..	..	Softening. R. int. caps and r. motor area. Clot in r. ventricle.	..	Greatly increased.
Dura thickness.	Marked engorgement.	..	..	Softening—hemorrhage. Marked pons hemorrhage.	..	Marked increase.
Pia thickened.	Sclerotic thick arteriosclerosis.	Not remarkable.	..	..	14,159	30 cm.
Dura negative. Pia thick and granular.	Congestion.	Narrowed.	Narrowed.	Softening, acute perivascular inflammation. Edema.	15,509	Cloudy. Gray. 1,200 polys.
No head permission			..	..	..	Increased.
..	No head permission		..	Cerebral hemorrhage.	..	Bloody.
Dura smooth, glistening.	..	..	..	..	..	25 cm.
Sub-arachnoid hemorrhage.	Blood around base of brain. Parietal area.	..	..	Blood in lateral ventricles.	..	Not measurable. Bloody.
Sub-arachnoid hemorrhage.	Circle of Willis plaques and sclerosis.	Flattened.	..	Blood in ventricles.	14,309	Bloody.
..	No head permission		..	..	..	..
Pia at base thickened.	Engorgement.	..	..	Softening. Hemorrhages in lateral ventricles.	..	Increased pressure.
Edematous.	Congested arteriosclerosis degeneration of vessel walls.	Flattened.	Narrowed.	Edema.	13,659	25 cm.

CHART 2

AUTOPSIES PERFORMED ON HYPERTENSIVE CASES.—PRIMARILY NEPHRITIC—SECONDARILY SCLEROTIC

Case—Age	*Retina*	*Blood Pressure (Average)*	*Heart (Aorta)*	*Kidneys*	*Urine*
1. I. M. (33–329) f–13	Retinal detachment. Retinal hemorrhage. Papilledema.	235/160	Myocarditis, hypertension. General arteriosclerosis.	Glomerulonephritis. Superimposed pyelonephritis.	Alb.+++
2. J.W. (32–505) m–21	Many flame-shaped hemorrhages and exudates. Papilledema.	170/116 256/134	Left ventricular hypertrophy. Chronic myocarditis and degeneration.	Glomerulonephritis (chronic) 3d stage with arterionephrosclerosis.	Alb.+++
3. A. D. (32–268) f–38	Numerous hemorrhages. Papilledema.	250/170	Advanced myocardosis. Aorta dilated. Atherosclerosis.	Glomerulonephritis (chronic). Arteriolar nephrosclerosis.	Alb.+++ Urea 40
4. P. T. (31–295) f–	Arteriolar sclerosis, moderate. No exudates or hemorrhages. Papilledema.	150/100	Toxic myocardosis. Early aortic atherosclerosis.	Glomerulonephritis (acute and subacute). Toxic nephrosis.	Alb.++++
5. L. S. (31–303) f–	Arteriosclerosis, marked. Papilledema, moderate.	158/90	Toxic myocardosis. Early atherosclerosis. General arteriosclerosis, early.	Pyelonephritis (chronic extensive) with hydronephrosis.	Alb.++++
6. B. M. (30–429) m–36	Arteriosclerosis. Retinal hemorrhages and exudates. Papilledema—marked.	204/142	Diffuse myocarditis. Atherosclerosis of aorta. General arteriosclerosis, marked.	Glomerulonephritis (chronic). Arteriolar nephrosclerosis far advanced.	Alb.+++
7. E. P. (30–422) m–26	Arteriolar sclerosis, marked. Retinal exudates. Discs obscured by exudates.	122/76	Fine myocardial fibrosis. Marked arteriosclerosis of aorta. General arteriosclerosis.	Acute pyelo-nephrosclerosis. Arteriolar nephrosclerosis with glomerulosclerosis.	Alb.+++
8. T. A. (32–599) m–45	Most vessels buried or destroyed. Many new and old hemorrhages. Papilledema.	240/160	Hypertension. Fine diffuse myocarditis. Atherosclerosis, aorta and coronary.	Glomerulonephritis (chronic). Arteriolar sclerosis. Far advanced arterionephrosclerosis.	Alb.+
9. J. H. (30–167) m–61	Papilledema marked.	258/120	Myocardial hypertrophy.	Glomerulonephritis (chronic) with superimposed acute pyelitis. Arteriolar nephritis.	Alb.++++
10. B. S. (30–236) f–29	Retinal exudates and hemorrhages—numerous. Papilledema.	250/160	Chronic focal pericarditis. Hypertrophy left ventricle.	Glomerulonephritis (chronic) arteriolar nephrosclerosis.	Alb.+++ U.N. 150 188
11. A. N. (28–358) f–21	Retinal exudates and hemorrhages. Papilledema.	..	Pericarditis.	Pyelonephritis (chronic) Arteriolar nephrosclerosis.	Alb.+++ U.N. 292
12. E. W. (29–133) f–59	Retinal detachment. Retinal "scars." Papilledema.	134/56	Hypertension. Myocardial fibrosis and dilatation.	Focal nephrosclerotic.	Alb.+++
13. B. V. (28–517) f–43	No hemorrhages or exudates. Papilledema—marked.	..	Endocarditis.	Glomerulonephritis (subacute) far advanced.	Alb.++ U.N. 255
14. G. A. (30–70) m–59	No hemorrhages. Papilledema.	148/80	Toxic myocarditis. Atherosclerosis of aorta.	Polycystic (advanced). Interstitial nephritis, chronic.	No work
15. W. H. (29–16) m–39	Retinal exudates and hemorrhages, numerous. Papilledema.	210/130	Hypertrophy of left ventricle. Edema of the heart.	Glomerulonephritis, chronic and acute cystic degeneration.	Alb.+++
16. E. B. (27–338) f–21	Papilledema slight. Arteriolar sclerosis. Retinal edema.	175/100	Myocardium and arteries show thickening. Fibrous and degenerative hypertrophy. Toxic myocarditis.	Vascular nephritis, chronic, far advanced	Alb.++++
17. W. F. (30–282) m–34	Retinal exudates and hemorrhages.	210/120	Toxic myocarditis.	Glomerulonephritis, advanced. Arteriolar nephrosclerosis. Pyelonephritis.	Alb.+++
18. E. B. (36–33) f–	Retinal hemorrhage and exudates. Retinal edema. Papilledema.	245/145 Post-operative 160/ to 190	Atherosclerosis of aorta.	Arterio-nephrosclerosis.	Alb.+++

CHART 2

AUTOPSIES PERFORMED ON HYPERTENSIVE CASES.—PRIMARILY NEPHRITIC—SECONDARILY SCLEROTIC

Meninges	*Vessels*	*Convolutions*	*Sutures*	*Appearance*	*Weight*	*Spinal Pressure*
No head permission			..	..	..	24 mm.
Normal.	Moderately congested.	Flattened.	Narrowed.	..	1,700 g.	Slight increase.
Dura tense.	Appear congested.	Flattened.	Narrowed.	Edema and general pallor. Anemia.	1,210	No increase.
Dura taut.	Moderately congested.	Flattened.	..	Edema.	..	No tap.
No head permission			..	..	..	No tap.
No head permission			..	..	..	No tap.
Dura normal. Pia cloudy at base.	..	Flattened superiorly.	..	..	1,295 g.	Not given. No increase in fluid.
Normal.	Moderate arteriosclerosis.	Flattened.	Narrowed.	..	1,180	32 cm.
Normal.	Nothing abnormal.	Flattened.	Narrowed.	Edema—wet.	1,215	No tap.
Not complete			..	Edema.	..	No tap.
No head permission			..	..	..	No tap.
Normal.	Venous engorgement.	Not remarkable.	..	..	..	..
..	..	Flattened.	..	Edema.	..	Increased greatly.
Congestion and thick pia.	Generally thick and plaques.	Flattened.	..	Edema, congestion.	1,215 g.	..
No head permission			..	Uremia.	..	13 cm.
No head permission			..	..	..	30 cm.
Normal.	Slight congestion.	..	Narrowed	Edema, congestion.	1,275 g.	Very high.
Normal.	..	..	..	No edema. Very pale.	1,140	..

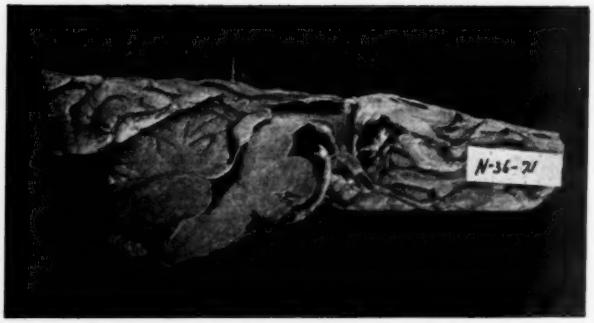


Fig. 12 (Lyle). Atheromatous changes best seen in the basilar artery.

terior cerebral artery had produced a softening of the temporal and occipital lobes, with implication of the left visual cortex and optic radiations.

Figure 12 (N 36—71) shows the brain of a man, aged 80 years, with marked atheromatous changes best seen in the basilar artery. The pons shows an area of softening from a thrombosis of a small pontine vessel from the basilar artery.

In the aged and the arteriosclerotic, as the nourishment to the brain is reduced, shrinking of the tissues occurs. The convolutions are rounded and separated by widened fissures through which sclerotic vessels pass. Lacunae, or spaces, usually miliary in size, form in the tissue of the brain. They have an analogy in the senile spaces found in the retina of the eye. Because of the shrinkage of the brain tissue, the ventricles become enlarged so that a compensatory hydrocephalus develops as is demonstrated in the brain section, figure 13 (N 28—195). This man, aged 85 years, had a marked cortical atrophy.

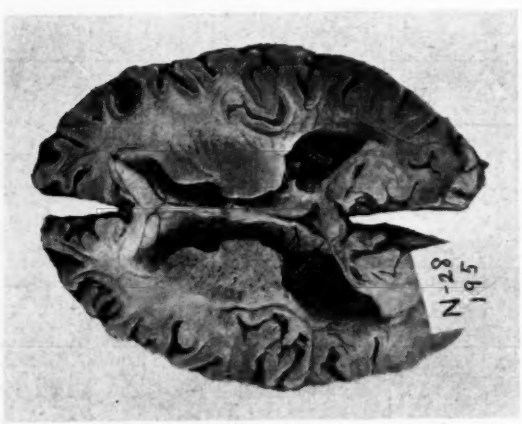


Fig. 13 (Lyle). Senile sclerotic brain with compensatory hydrocephalus.

Arteriolosclerosis in the brain is found in the arterioles and capillaries, most frequently in the cortex, nuclei, and medulla. Hyalinization of the walls is produced in the intima and the media. The adventitia may be affected later.

Other arteriosclerotic conditions, both in the brain and in the retina, such as capillary fibrosis, endarteritis, and calcification, are relatively rare and will merely be mentioned here.

Hypertensive encephalopathy and retinopathy

Hypertensive encephalopathy with retinopathy is an acute or subacute, probably toxic, circulatory disturbance of the brain and retina which occurs usually with high blood pressure. Hypertensive states in the acute form may occur without the presence of arteriosclerosis. Examples of this are found in the toxemia of pregnancy and in lead poisoning. However, the more common subacute types usually have an advanced arteriosclerotic background, more marked in the primary sclerotic and less marked in the primary glomerulonephritic types of hypertension.

The inciting factors of malignant and nephritic hypertensive states are not clearly understood. Constriction of the arterioles and capillaries and proliferation in their walls may play a part. Pathologic changes are not constant. The commonest cerebral

and retinal symptoms are due to the edema, which in the brain produces an increased intracranial pressure. The production of this edema is due to the vascular and circulatory changes, to which are added the toxic factors of remote and local disturbed metabolism.

In the brain and the retina edema and hemorrhages are present. The papilledema may be so marked as to present the appearance of a choked disc (fig. 14). If the vascular system is chiefly involved, arteriosclerotic retinosis, or at least a marked

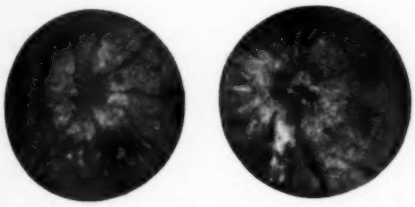


Fig. 14 (Lyle). Marked papilledema in malignant hypertension.

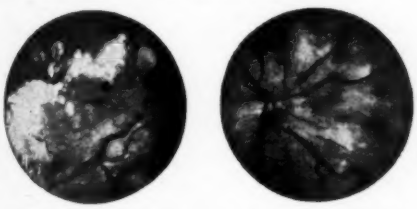


Fig. 15 (Lyle). Marked retinal and papilledema in glomerulonephritis.

retinal arteriosclerosis, is present. If glomerulonephritis is prominent, the fundus has the appearance of a renal retinosis (fig. 15). However, as is definitely shown by a study of the accompanying charts, both conditions are usually present, one generally preceding and dominating the other. Charts 1 and 2 comprise a series of autopsies of hypertensive cases that exhibited marked retinal changes which were studied and recorded clinically. The chief areas of interest were charted;

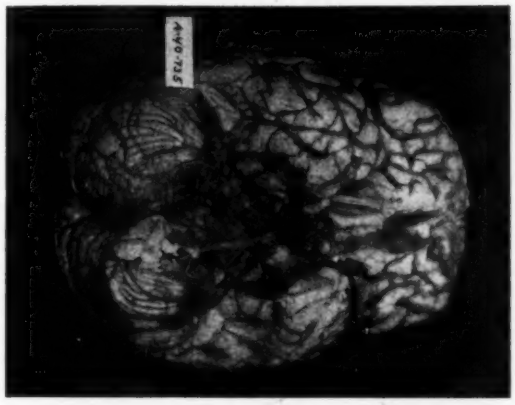


Fig. 16 (Lyle). Basal view of brain of case of malignant hypertension.

namely, the cranial contents, the heart and kidneys, to which were added the blood pressure and the urinary and spinal-fluid findings.

In both the primary arteriosclerotic and glomerulonephritic types, the heart was found to show degenerative or inflammator changes. The kidneys were found to be the seat of vascular nephrosclerosis or glomerulonephritic degeneration or both, one more pronounced, depending upon the type. In most cases there was an increased intracranial pressure which was, in some cases, determined before death by spinal-fluid pressure. The brain was, with very few exceptions, edematous—the so-called "wet brain." The con-

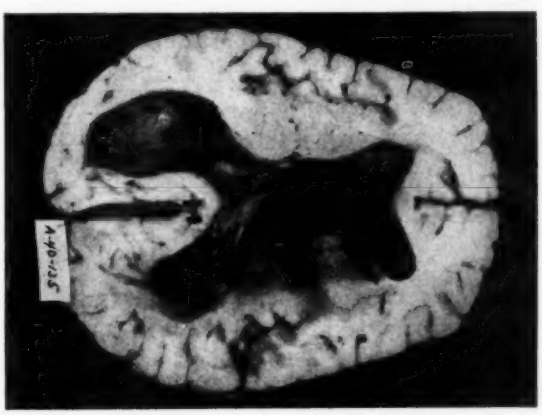


Fig. 17 (Lyle). Section of same brain showing edema and hemorrhage into ventricle.

volutions were flattened against the unyielding skull wall, and the fissures were narrowed or even obliterated because of the increased edema. Hemorrhages were frequent in the brain tissues, in the cerebrospinal fluid spaces, and in the retina.

Figures 16 and 17 (A 40-135), show the base of the brain of a woman, aged 32 years, who had suffered from malignant

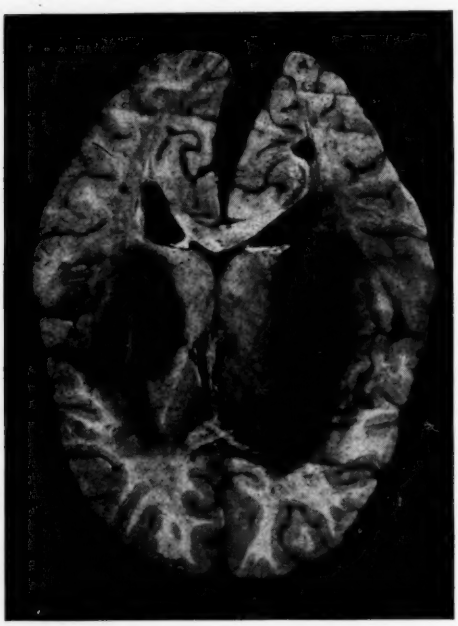


Fig. 18 (Lyle). Cerebral hemorrhages and edema in malignant hypertension.

hypertension. The ophthalmoscopic examination revealed retinal arteriosclerosis with papilledema and retinal edema. The illness terminated in a fatal hemorrhage during which the head and eyes were turned to the left in a conjugate deviation, the lesion probably implicating the internal capsule on the left side. The pupils were dilated and fixed. The brain showed marked edema throughout, with flattened convolutions and narrowed fissures. There was some congestion of the smaller vessels, with arteriosclerosis of the larger ones.

Figure 18 (C 41-6) shows the brain of a boy, aged 13 years, with malignant hypertension. The massive cerebral hemorrhages are visible, one having ruptured into a lateral ventricle. There was a marked cerebral congestion and edema. Petechial hemorrhages were seen throughout the brain. The convolutions were flattened, and the sutures narrowed. There were a retinal edema and a papilledema with retinal hemorrhages.

Sequelae of arteriosclerosis

Hemorrhage. One of the most frequent sequelae, manifestations, or complications of cardio-vasculo-renal affections of the retina and brain is hemorrhage. It may be petechial in size, as are those seen in the splinter or thornlike hemorrhages of endocarditis, in which the slight extravasation may be due to an impaired circulation, diseased vessel walls, or multiple emboli. Diabetic hemorrhages (fig. 5) are usually small and round, occurring in the deeper layers of the retina. Arteriosclerotic hemorrhages may present a similar appearance, or they may occur in the nerve-fiber layer as flame- or comet-shaped hemorrhages (fig. 10). Subhyaloid or vitreous hemorrhages may assume different shapes and may be of large size.

When the artery is obstructed, as a rule an ischemia is produced in the tissue it nourishes, although a hemorrhage may occur from an artery behind an embolus and break through into the surrounding tissues. Venous obstruction, on the other hand, with or without thrombosis, may result in rupture of the wall with marked hemorrhage.

Cerebral hemorrhages are usually arterial, and, depending upon their location and on the amount of bleeding, various symptoms occur. Cerebral hemorrhages generally arise from an arteriosclerotic vessel, a ruptured aneurysm, or an infected vessel behind an embolus.

There are certain types of hemorrhagic encephalitides which will not be discussed here. The hemorrhages may involve the tissues of the brain, or may occupy the dural and arachnoidal spaces or the ventricles of the brain. They may be massive enough to produce increased intracranial pressure with papilledema (see charts 1 and 2).

Hemorrhage in the posterior frontal area, knee of the internal capsule, and peduncle may produce a conjugate deviation of the eyes. Hemorrhages in or about the brain stem may cause paralysis of one or of several of the external or internal eye muscles. Hemorrhages in the posterior temporal, lower parietal, or occipital lobes may produce visual-field changes which will be discussed further on.

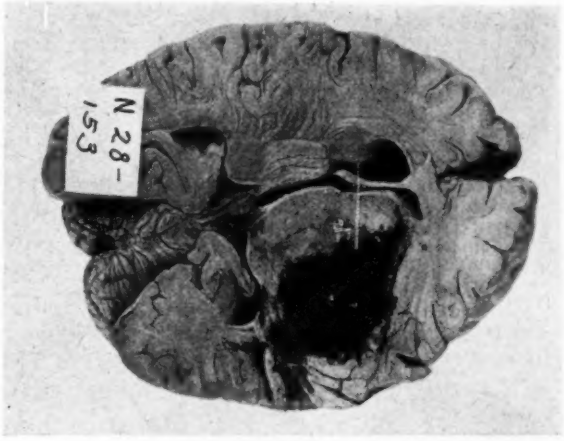


Fig. 19 (Lyle). Hemorrhage in internal capsule producing conjugate deviation of eyes.

Unlike the thrombus, which occurs when the blood pressure is lowered, and the embolus, which produces infarcts from cardiac or pulmonary infections, hemorrhage occurs with a rise in the blood pressure. It has a better prognosis than thrombus and embolus, as hemorrhages have a tendency to absorb, and, if no damage from their force or bulk has been done, symptoms may improve. Occasionally, the hemorrhages organize and behave as does a tumor.

Figure 19 (N 28-153) pictures a brain section of a woman, aged 50 years, who had cardiac hypertrophy and chronic vascular nephrosclerosis. The fundi showed advanced arteriosclerotic retinitis. A hemorrhage implicated the internal capsule, and produced a conjugate deviation of the eyes.

Figure 20 (A 38-84) shows a brain section with a blood clot in the left hemisphere involving the thalamus, knee, and posterior limb of the internal capsule. The basal and other arteries show numerous atheromatous plaques. Examination of the patient revealed conjugate deviation of the head and eyes to the right. The right pupil was dilated, and both pupils reacted to light. A right facial weakness was present. The aberrant pyramidal fibers to the oculogyric and cephalogyric nuclei were involved within the knee of the internal capsule.

Thrombosis of the arteries of the brain and eye is relatively frequent. Thrombosis of the veins of the retina is about as frequent as is that of the arteries, but the veins, excepting the venous sinuses of the brain, are less likely to thrombose than are the arteries. Thrombosis increases with the age of the patient and the amount of arteriosclerosis present. It is the result

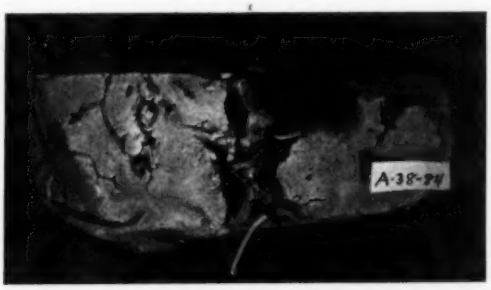


Fig. 20 (Lyle). Thalamic hemorrhage with conjugate deviation of eyes.

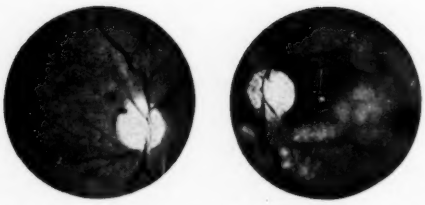


Fig. 21 (Lyle). Thrombosis of inferior temporal artery of left eye.

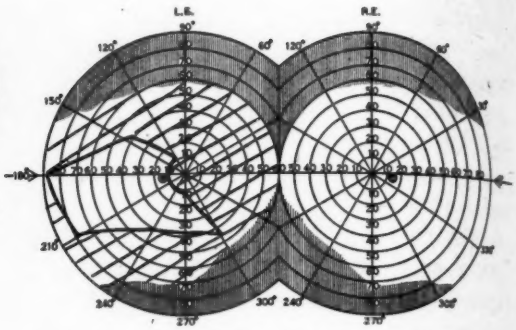


Fig. 21A (Lyle). Field defect from thrombosis of retinal artery.

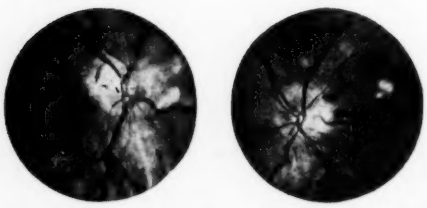


Fig. 22 (Lyle). Another case of thrombosis of inferior temporal artery of left eye.

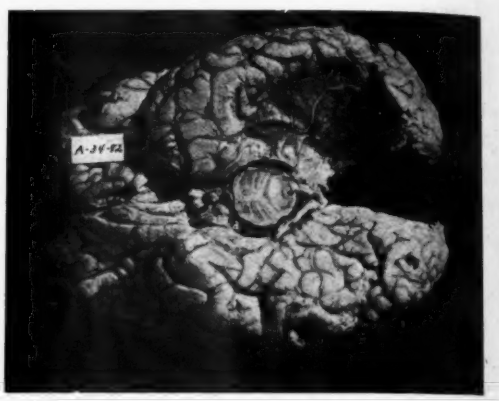


Fig. 25 (Lyle). Thrombosis of left posterior cerebral artery.

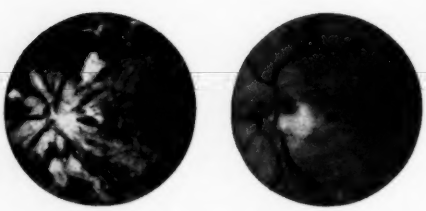


Fig. 23 (Lyle). Thrombosis of central retinal vein and the same fundus three months later.

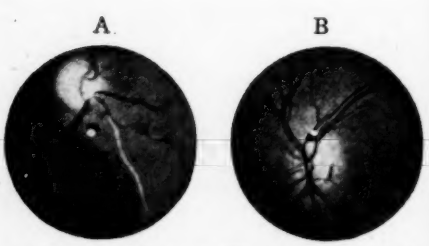


Fig. 24 (Lyle). A, Fibrotic or calcified vessel. B, Vascularization around a blockage at an arteriovenous crossing.

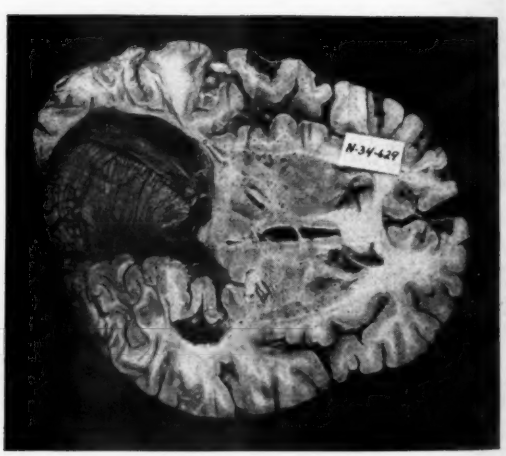


Fig. 26 (Lyle). Thrombosis of left posterior cerebral artery.

of diseased vessel walls, with a reduction of the lumen and a thickening of the intima. In addition, there are usually an increase in the coagulability of the blood and a slowing of the circulation. An embolus may slow the circulation, permitting the formation of a thrombus, or it may form after the reduction of the blood pressure following a hemorrhage. Even a slight rest that permits the reduction of blood pressure may be sufficient to cause the formation of a thrombus.

In the retina, a closing of the arterial lumen with a thrombus results in an ischemia, swelling and degeneration of that part nourished by the vessel, and the production of a loss in the visual field corresponding with this area.

Figure 21 shows a thrombus of the inferior temporal artery, with retinal degeneration and loss of vision (fig. 21A) in the area affected. Figure 22 is another case of thrombosis of a retinal artery.

Thrombosis of retinal veins occurs chiefly in the proximity of arterial crossings. From the arteries they derive a common vessel wall with all its tendencies to disease. Thrombosis of veins is evidenced by hemorrhages in the retina, usually at a point of constriction. These hemorrhages have a tendency to become absorbed, with restoration of some vision at least.

Figure 23 shows a thrombosis of the retinal vein, and the same case about three months later. Much of the vision has been restored. The absorption of the hemorrhage and the return of vision may be aided by a collateral or repaired circulation, which is occasionally seen even before the hemorrhage occurs.

Figure 24 shows the formation of new vessels behind an arteriovenous crossing where the vein is becoming compressed.

Thrombosis of cerebral arteries is found relatively frequently in arteriosclerotic patients who have superimposed toxemias and infections. It forms in those individuals exhibiting a lowering of the blood pressure, whereas hemorrhages are frequently the result of increased blood pressure.

Thrombosis of the ophthalmic or the central artery of the retina may lead to sudden blindness. After a week or two of recurrent dimness of vision the patient may awake one morning and find himself blind, not infrequently in both eyes. I recall seeing a patient who developed complete blindness during sleep. He was a man, aged 65 years, with generalized arteriosclerosis and a low blood pressure. His fundi were pale. Some blood in broken columns was still passing through the retinal vessels, slowing to a stop, and then moving on. The vessels were markedly sclerotic. There were no retinal hemorrhages nor exudates.

Thromboses of the middle cerebral artery may show homonymous visual-field changes, and, if they are on the left side in right-handed persons, they may produce various types of aphasia or apraxia. Thrombosis of the posterior cerebral artery involves the optic radiations and visual cortex producing homonymous field changes.

Figure 25 (A 34-82) is an illustration of the brain of a man, aged 73 years, with a blood pressure of 140/95, who had developed a thrombosis of the left posterior cerebral artery which supplies the posterior optic radiations and visual cortex. A right homonymous hemianopia was present. At postmortem examination a marked cerebral arteriosclerosis with narrowed convolutions, widened fissures, and compensatory hydrocephalus were found. There was a softening of the basal temporal and basal and medial occipital lobes.

Figure 26 (N 34-629) shows a section through the brain with a similar involvement of the left posterior cerebral artery in a woman, aged 62 years. On post-

mortem examination, almost complete destruction of the visual cortex and optic radiations was found. This case showed marked atheromatous changes in the basal vessels.

Embolism. Emboli are occasionally found in the retinal arteries, most frequently in the central artery within the papilla, where constriction and bifurcation of the vessels occur. The embolus,

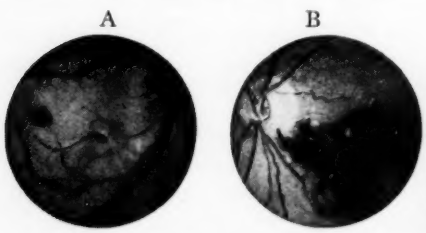


Fig. 27 (Lyle). A, Embolus in central retinal artery. B, Venous hemorrhage from blocking at papilla.

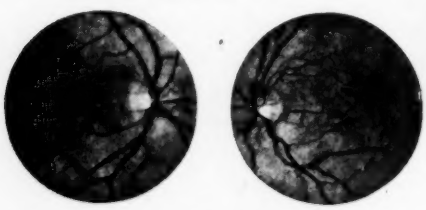


Fig. 28 (Lyle). Endocarditis with thornlike hemorrhages in right retina.

by cutting off the blood supply to the retina, resulting in an ischemia, edema, and degeneration of the anterior layers of the retina, immediately produces blindness. Some vision may be retained if nourishment is provided by the cilioretinal vessels.

Figure 27 shows the retina of a young man who was suffering from an endocarditis and who suddenly became blind while at work. Shortly after the picture was taken the temperature rose to 105°F. The patient died several days later, death being due to the complications of septic emboli.

Occasionally, in endocarditis, minute splinterlike or thornlike hemorrhages are seen in the retina. Some observers believe these are due to minute emboli in the arterioles and terminal vessels.

Figure 28 represents the retina of an advanced case of endocarditis with marked cyanosis, which is also visible in the fundi. In one central field these small, thornlike hemorrhages are seen. A central scotoma was present in this eye. Vision in the other eye was normal.

Cerebral emboli produce infarcts resulting in symptoms depending upon the location. Figure 29 (N 33-158) shows emboli in the brain of a man, aged 30 years. Examination revealed an embolus of the left middle cerebral artery which produced a softening of part of the frontal, temporal, and parietal lobes, lenticular nucleus, and internal capsule. This involved many areas of interest to the ophthalmologist: the eye motor center in the posterior part of the middle frontal convolution, and the knee of the internal capsule through which the aberrant fibers pass to the eye motor nuclei. Involvement of these areas had resulted in the conjugate deviation of the eyes to the right. The higher psychic visual centers —the angular and supramarginal gyri—

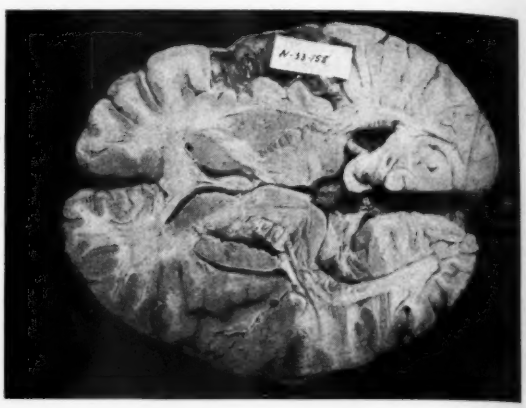


Fig. 29 (Lyle). Emboli in branches of left middle cerebral artery.

were involved, as well as part of the optic radiations. This may have produced aphasias and apraxias of various types and homonymous visual-field changes.

An embolus in the posterior cerebral artery interrupting the optic radiations is seen in figure 30 (N 30-184). A man, aged 42 years, with cardiac hypertrophy, chronic myocarditis and endocarditis, and syphilitic aortitis had an embolus lodge in his left posterior cerebral artery which produced an infarct in the white matter of the temporal and occipital lobes affecting the optic radiations, resulting in a homonymous hemianopia.

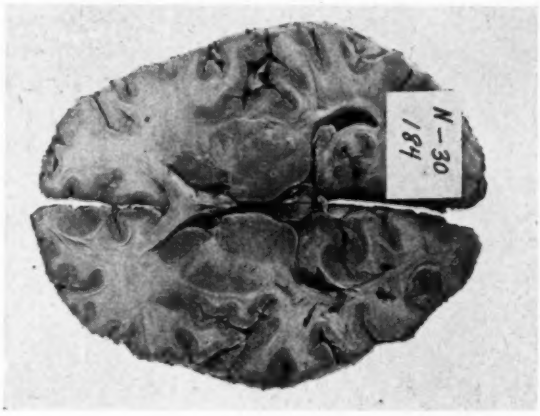


Fig. 30 (Lyle). Embolus in posterior cerebral artery implicating optic radiations.

Aneurysms are found infrequently in the retina, but are relatively common in the brain. Retinal aneurysms are usually of the miliary or dissecting type, and usually occur in the smaller vessels, where there is a constriction, such as a vessel crossing. Retinal veins also show aneurysmal dilatations at vessel crossings in certain types of arteriosclerosis. Figure 27 B, shows a rupture of a vein at the disc margin. Prior to the rupture the vein was dilated as a result apparently of a blockage produced by a small cystlike object in the nerve head which is visible in the illustration.

Aneurysms in the carotid artery frequently implicate the optic nerve, chiasm, or tracts. Figure 31 is a retinal photograph of a bilateral optic atrophy in a woman in whom an aneurysm was found between the optic nerves at the chiasm, arising from the left internal carotid artery and extending up the left ophthalmic artery. The visual fields revealed a bitemporal hemianopia (fig. 31A).

Figure 32 (N 34-628) shows an aneurysm of the left internal carotid artery, with rupture into the subarachnoid space, displacing the left optic nerve. An optic atrophy of the left eye had been present for years.

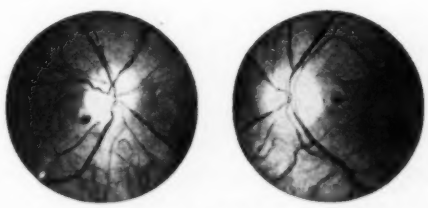


Fig. 31 (Lyle). Optic atrophy from aneurysm of internal carotid and ophthalmic arteries.

Figure 33 (N 34-422) is an illustration of an aneurysm of the basilar and the right vertebral arteries. Marked cerebral

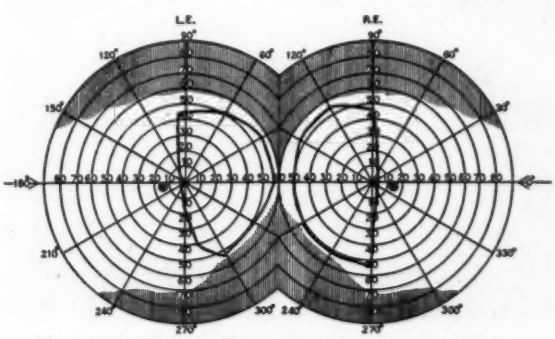


Fig. 31A (Lyle). Bitemporal hemianopia from aneurysm of carotid artery.

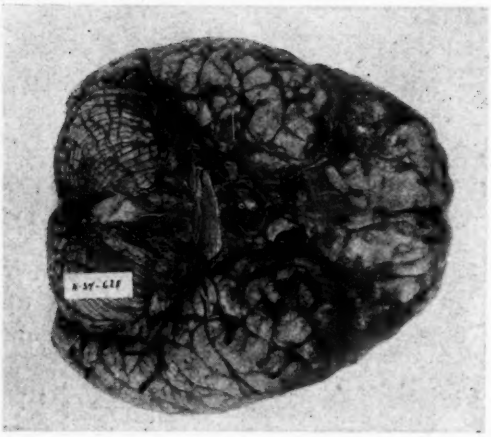


Fig. 32. (Lyle). Aneurysm of left internal carotid artery.

arteriosclerosis with atherosclerosis was found. The patient was a man, aged 82 years, who had paralysis of several cranial nerves, and had been blind for years owing to advanced arteriosclerotic retinitis.

Vascular lesions producing visual-field defects. Arteriosclerosis or hypertension in itself very infrequently produces a visual-field defect. However, when these lesions are combined with or augmented by toxic or metabolic affections so as to produce more serious disturbance to the nourishment of the tissues, conditions arise which affect the visual fields.

In the retina hemorrhages, thromboses, and emboli impair vision, depending upon the nature, location, and extent of the vascular lesion. The visual-field defect corresponds to the area of the retina involved.

The optic nerve is seldom involved in vascular lesions, except secondarily, owing to a deficient blood supply. Chiasmatic arachnoiditis, meningovascular syphilis, and advanced arteriosclerosis may impair the nourishment to the optic nerve. Pressure from tumors such as aneurysms (fig. 31) and pituitary neoplasms, is not infrequently the cause of field defects from optic-nerve implication.

Fig. 34 (Lyle). Anatomic demonstration of chiasmal area.

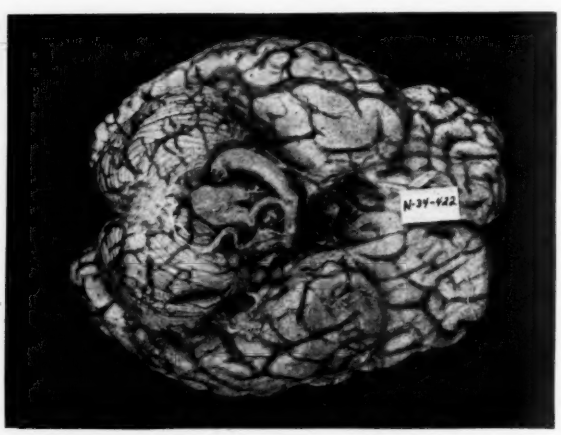


Fig. 33 (Lyle). Aneurysm of basilar and right vertebral arteries.

Marked arteriosclerosis of the base of the brain, by affecting the intracranial portion of the optic nerves, chiasm, or tracts, produces field changes. Figure 34 (N 39-38) demonstrates the relationship between the internal carotid artery and the chiasmal area. From this it is not difficult to visualize binasal, altitudinal, or bizarre field changes.

Figure 35 represents the retina of an advanced arteriosclerotic. The illustrations show a cavernous atrophy of the disc—so-called "pseudoglaucoma." The visual fields indicate binasal hemianopia.

Figure 36 shows an altitudinal and nasal defect produced by the pressure of sclerotic arteries on different parts of the optic nerve, chiasm, or tract. The fundus reveals some pallor of the papilla, with the senile type of arteriosclerosis. X-ray study showed some

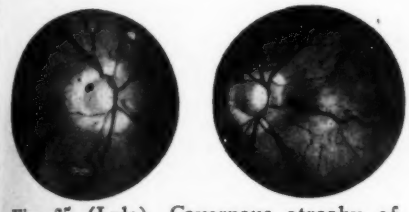


Fig. 35 (Lyle). Cavernous atrophy of optic discs or pseudoglaucoma.

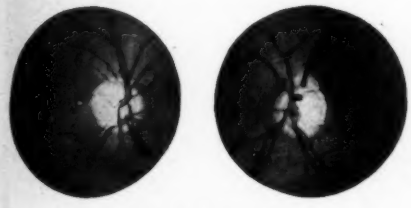


Fig. 36 (Lyle). Optic atrophy from carotid sclerosis.

shadow of the knee of the carotid arteries.

The optic tract is rarely implicated in vascular lesions, except as the result of blood clots and aneurysms. Near the chiasm bitemporal defects may appear in the visual fields. More frequently there are homonymous sector or quadrant defects, incongruous in relationship one to the other, with sloping edges. In tract lesions the central vision (macular bundle) is more frequently involved than is the case when the optic radiations and cortex are affected. However, visual fields in themselves do not definitely establish the site of lesions in homonymous field defects. This may be in tract, radiation, or cortex. Wernicke's phenomenon is uncertain and difficult to obtain.

As the radiations fan out from the lateral geniculate body through the posterior temporal and occipital lobes and lower border of the parietal lobe to the visual cortex, visual-field defects may vary greatly in size and shape. In these

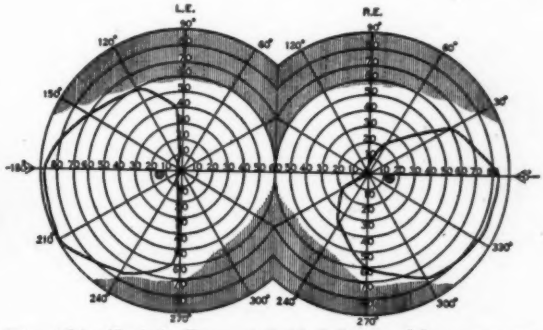


Fig. 35A (Lyle). Binasal field defects with cavernous atrophy of discs.

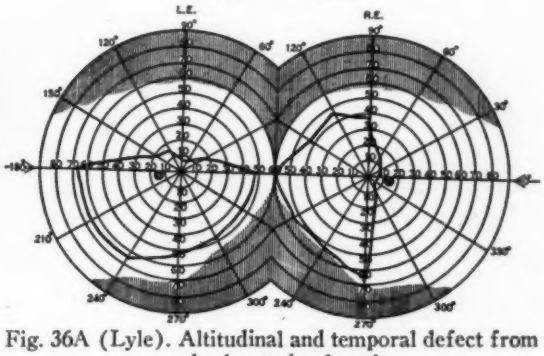


Fig. 36A (Lyle). Altitudinal and temporal defect from cerebral arteriosclerosis.

cases the field defects are usually congruous throughout their development or recession. The central fixating area is generally spared, probably because of a dual blood supply, although some believe that the macular representation is quite extensive in the visual cortex. In the brain substance, as in the retina, the vascular lesions that produce the visual-field changes are usually hemorrhage, thrombus, and embolism.

A woman, aged 58 years, has, as is shown in the illustration (fig. 37), a ret-

inal arteriosclerosis. Her blood pressure is within normal limits. Her visual fields show a homonymous lower-quadrant defect which apparently is due to a softening, the result of a thrombosis of the upper optic radiations or visual cortex on the left side. As some sensory aphasia is present with visual and auditory disturbances, the lesion is fairly well localized in the region of the angular gyrus and adjacent superior posterior temporal convolution.

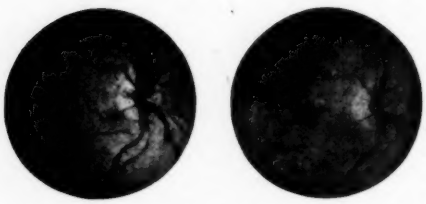


Fig. 37 (Lyle). Progressive retinal vascular changes with cerebral thrombosis.

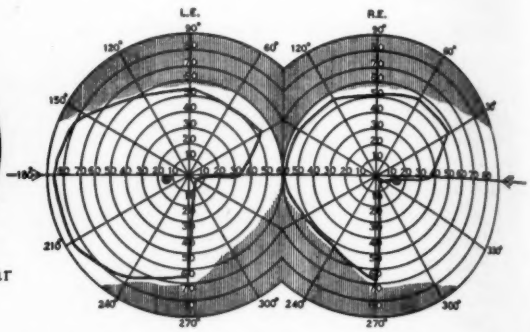


Fig. 37A (Lyle). Lower homonymous quadrant defect.

Fig. 38 (Lyle). Retinal sclerotic changes in right and left eye.

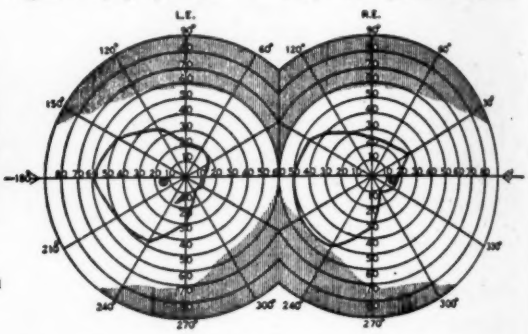


Fig. 38A (Lyle). Homonymous hemianopia from cerebral arteriosclerosis.

Figure 38 shows a more marked vascular condition in which the symptoms from hemorrhage when the blood pressure is raised, and from thrombosis when the pressure is lowered, are seen. This case was an interesting one. The patient was the mayor of a neighboring town and was a great reformer. Because of his daily court sessions, his physicians could follow his case as he made front-page news in the press. It was not uncommon for him to collapse and to be carried out with a hemorrhage from which he would recuperate and return to the battle. Occasionally he would not run for mayor and would rest. At these times, his blood pressure would become much lower with the tendency to thrombosis. When first seen, the blood pressure was normal, the visual fields showed a homonymous hemianopia (fig. 38A). The fundi showed a marked arteriosclerosis. Later the blood pressure increased and the fundus of the left eye became edematous with the appearance of hemorrhages. Finally, after several more episodes, the headlines in the press read, "Mayor ———— stricken by brain hemorrhage, collapses in court." He did not survive this attack.

904 Carew Tower.

A MODIFICATION OF THE CORNEAL SECTION IN THE OPERATION FOR CATARACT*

An ab externo approach

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The ideal section, be it corneal or scleral, for the removal of cataract is one in which the superficial and deep margins of the operative wound are parallel and coextensive. This obviously can be achieved only when the completed incision is perpendicular to the plane of the globe. As usually performed with the cataract knife or keratome, the section is, of necessity, beveled, since the instrument enters and leaves the anterior chamber at an acute angle. As a result of this beveling or shelving, the inner lip of the wound, and hence the entrance into the anterior chamber is somewhat shorter than the external incision. A successful cataract extraction depends, in no small measure, upon a correct corneal section. A poorly executed section not only impedes the operation but may even eventuate in disaster. It is very important that the exit for the passage of the cataract be adequate for its easy transit.

The author has devised a simple technique that meets the stated requirements of the ideal section. This technique is not mentioned in any of the available textbooks, nor has a rather hasty survey of the literature revealed any allusion to it.

The writer proceeds as follows:

The operative field is prepared in any of the accepted ways, preference being given to carefully dabbing the lid margins with tincture of iodine. The orbicularis oculi is paralyzed by injecting 2-percent solution of novocaine in the facial nerve in front of the tragus. Surface anesthesia is accomplished with the use of cocaine. Retrobulbar anesthesia, a solution of novocaine and adrenalin, is resorted to only when the surgeon apprehends lack of coöperation on the part of the patient or when increased intraocular pressure is present. The eyeball is depressed with a bridle suture through the belly of the superior rectus muscle; this also helps to steady the eyeball. The ends of the suture are held by a mosquito artery clamp, or, better still, by the fingers of the assistant who can thus regulate the tension of the suture, and so control the degree of the depression of the eyeball and avert undue separation of the lips of the operative wound.

The incision, approximately a semicircle in the upper periphery of the cornea, is divided into three parts, each subdivision being demarcated by dots made with a sharp-pointed toothpick dipped in alcohol gentian-violet solution. The first dot is 1 mm. above the lateral extremity of the horizontal meridian of the cornea and slightly in front of the corneoscleral junction. (The corneoscleral junction is the posterior boundary of the limbus. The limbus is widest superiorly and narrowest at the sides. Not infrequently, the limbus is unduly wide above. One must not confuse an arcus senilis, which is often prominent in these cases, with the continuation of the limbus. There is always a narrow transparent ring between the anterior limit of the limbus and the peripheral margin of the arcus senilis.) The second dot is similarly placed in relation to the medial extremity of the horizontal corneal meridian. Two dots are painted on the cornea above, circumscribing a

*Read before the New York Society for Clinical Ophthalmology on January 3, 1944.

3-mm. interval, each dot being equidistant from the respective extremity of the horizontal meridian (fig. 1). An attempt should be made to render the operative field bloodless to avoid blood seeping into the anterior chamber. This may be effected by instilling a few drops of adrenalin and making the incision wholly in the cornea somewhat behind the anterior border of the limbus. The surgeon need not fear that the opening into the anterior chamber will be inadequate for since the incision is perpendicular to the cornea, there is no need to make a very large flap when performing either an intracapsular or extracapsular extraction.

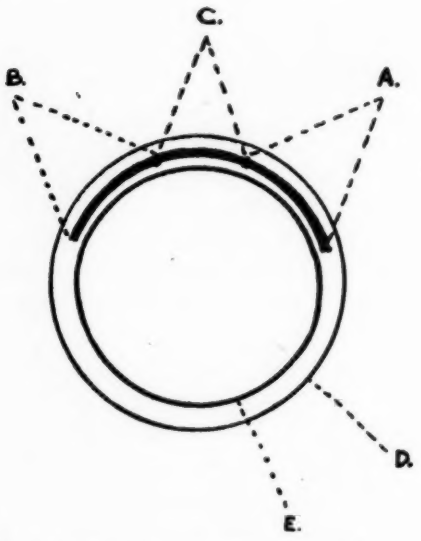

Fig. 1 (Bailey). Semi-diagrammatic.
A. First subdivision of section.
B. Second subdivision of section.
C. Third subdivision of section.
D. Posterior border of limbus.
E. Anterior border of limbus.

With conjunctival forceps a deep bite is taken into the conjunctiva a few millimeters behind the limbus, and by drawing the grasped tissue back and thus putting it on the stretch, the conjunctiva is prevented from overlapping the limbus and obscuring the path of the incision. Orientated by the stained dot at the extremity of the proposed section, the surgeon penetrates the cornea with the point of the knife. This he does lightly and slowly so as to avoid a sudden escape of the aqueous with the accompanying prolapse of the iris. It is desirable that the handle of the knife be held at an acute angle of about 45 degrees; otherwise, the back of its tip will also engage the cornea and penetration will be impeded. The incision should be wholly in the cornea since the sclera offers much greater resistance to the cutting instrument. Should the iris prolapse, it is easily replaced. The penetration of the cornea is continued until the ipsolateral upper dot is reached. The operator now sweeps a spatula between the lips of the wound to ascertain whether there be any uncut strands of tissue in the depth of the wound; if so, these are divided with a snip of the scissors. For this purpose the writer uses a very fine blunt-pointed curved scissors: in lieu of these, one may employ a curved iris scissors. Preliminary sutures, with loop sufficiently wide, so as not to impede the exit of the lens, are inserted into the lips of the incision. The opposite side of the cornea is now treated in like manner. There still remains the upper 3-mm. bridge of cornea: this is severed with a single cut of the scissors, and a suture into the anterior lip is so placed that it can be used later to reflect down the corneal flap as described by Kirby. If the surgeon contemplates an iridectomy, it can be done satisfactorily at this time, for, by raising the corneal flap the iris is exposed directly and fully, from pupillary margin to periphery, riding on the lens, and can be grasped at any optional point with great ease. At no time is dangerous pressure exerted upon the eyeball, for in all cases in which this method was used, there was no single instance of loss of vitreous prior to the completion of the

section and the introduction of the sutures.

As one proceeds with the operation, the eyeball becomes soft and the iris is in contact with the posterior surface of the cornea, owing to the unavoidable escape of the aqueous fluid. Should this offer any difficulty to the surgeon he may resort to the following alternative procedure: A deep groove is made with the knife along the line of the planned incision; at one end of the groove the cornea is perforated, and the subdivision of the incision is then completed as previously described with scissors instead of with the knife.

The remaining steps of the cataract extraction are those of the Verhoeff-Kirby technique. The writer, however, prefers to rupture the suspensory ligament with an ordinary lens spoon instead of with a muscle hook. The former has certain advantages. Being a one-directional instrument the operator can steady it more firmly, and thus measure more accurately the pressure he exerts upon the globe. Furthermore, because such an instrument can be maneuvered more easily, it is less likely to slip too far forward upon the cornea, or too far back over the ciliary body. The spoon is very thin and can be readily insinuated in the circumlental space between the apices of the ciliary processes and the equator of the lens so that the pressure can be exerted directly upon the fibers of the suspensory ligament and perpendicular to them, an obvious mechanical advantage; although Goldsmith (Transactions of the Section on Ophthalmology, American Medical Association, 1942) states that he has proved experimentally that the pressure is most effective when applied 2 mm. behind the limbus.

In suturing the corneal flap, it is important that the lips of the wound be firmly held in the grasp of a thin but sturdy mouse-tooth forceps; otherwise, they will slip out of the forceps during the passage of the needle. It is equally important that the needle take a deep bite so that it will not tear through the edges of the wound. In its progress through the tissue, the needle should describe an arc corresponding to its curvature. The needle should be very fine, consistent with strength; it must be well tempered to prevent bending; it should be short, full curved, keen pointed, and of the atraumatic type. I use a short suture, about 6 inches long. The ends of a short suture are more easily grasped and tied by the forceps, and are less likely to become entangled. One must not fail to take up the slack in the temporary loop before making the final knot of the suture.

Davis & Geck of Brooklyn, New York, have supplied me with a suitable atraumatic needle and suture. I quote their description: "The special sutures, C 301, consist of Anacap black braided silk rendered non-capillary by a special process. They are size, Six-0, length 18 inches, double-armed, with the finest size atraumatic needles. The needles are of polished carbon steel, with a special triangular point which is an improvement on the ordinary triangular point used on surgical needles."

The knife selected for the operation consists of a small handle (Bard-Parker handle, no. 6) and a curved blade that fits into the slot of the handle. The writer uses a blade made by the American Safety Razor Corporation of Brooklyn, New York. This blade (No. 12) is sharper and smaller than Bard-Parker's (see fig. 2). The blade is sufficiently keen, is removable, and inexpensive, costing about 12 cents. It may be discarded after each operation, but a thrifty surgeon can use it several times satisfactorily. I have employed this knife in many other operations on the eye; for example for operations on the lacrimal sac and wherever a small

knife is applicable. In my hands, it has supplanted the keratome for opening the anterior chamber in the following cases: iridectomy for glaucoma, optical iridectomy, and discission of cataract with scissors. There is no shelving of the operative wound, the anterior chamber is entered peripherally, and the manipulation of instruments in the chamber is facilitated.

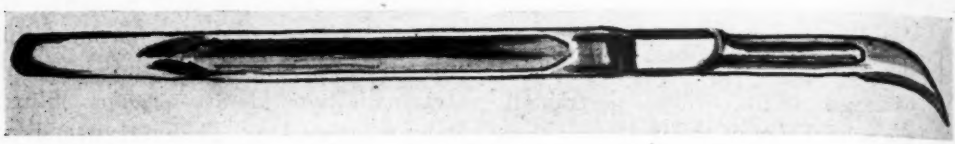

Fig. 2 (Bailey).

The author believes that the operation described herein presents the following advantages:

(1) Immobilization of the eyeball is not necessary, hence, the surgeon may dispense with the use of fixation forceps. Not infrequently fixation of the eyeball is unsatisfactory; especially if the conjunctiva is friable and a deep grasp of the episclera, for various reasons, is not obtained, or when the patient persists in moving or rolling the eyeball. Furthermore, when in an early stage of the cataract extraction, vitreous loss occurs or is impending and pressure upon the eyeball is meticulously to be avoided, the presence and action of the fixation forceps aggravate the situation. (2) The section is made in a single plane. With the cataract knife, the section is usually consummated in several planes and hence is irregular, for two or more strokes of the knife are required, and furthermore there is a tendency to a sawing motion. (3) The surgeon can control the size and position of the corneal section. As ordinarily performed, the corneal flap often deviates from the one planned or desired. (4) This section is feasible in the presence of a shallow anterior chamber or even when the chamber is completely obliterated. (5) The ample opening into the anterior chamber precludes the necessity of an extensive corneal section when performing the intracapsular type of extraction or when dealing with a large sclerosed lens. (6) There is no opportunity for the iris to fall upon the edge of the knife, as may happen when the section is made with a cataract knife. (7) The large opening in the periphery of the anterior chamber (thanks to the perpendicular direction of the knife) allows the surgeon to envisage the equatorial region of the cataract and permits its easy grasping by the forceps, especially when the corneal flap is reflected down as in performing the intracapsular extraction according to the method of Verhoeff as modified by Kirby. Likewise, a facile iridectomy can be performed, since the iris is in full view. (8) The location of the incision avoids the possibility of injury to the ciliary body, which may occur occasionally when the surgeon, while making the puncture or counterpuncture with the cataract knife, directs the point of the knife too far back, owing to the behavior of the patient or for some other patent reason. Nor does the surgeon have to watch the position of the point of the cataract knife when making the counterpuncture, as in the ordinary type of section. (9) There is less danger of vitreous prolapse since the section is divided into three parts and each subdivision is com-

pleted before proceeding with the next one. (10) The surgeon may choose his right or left hand when operating on either eye. Ambidexterity offers no advantage. (11) The knife is held easily and firmly against the eyeball throughout the operation: hence, the surgeon need not steady his hand upon the patient's face, as is done in the usual section with the cataract knife or keratome. (12) The operative wound is sutured with less difficulty and with greater security. Since the lips of the wound do not slant they are grasped with the forceps with less tendency to slipping and the needle takes a stronger bite without lacerating or tearing through the tissues. The lips of the wound are regular and readily brought into apposition, thus favoring healing and minimizing postoperative astigmia. (13) Although the knife has a sharp point and edge, it need not possess the exquisite keenness demanded of a cataract knife. (However, if for any reason the surgeon is not satisfied with the particular blade selected, he may use, instead, a Wheeler discission knife or a fine-pointed cataract knife.) (14) This technique has been employed with satisfaction in cases of ordinary senile cataract, subluxatio cataractae, cataract in high myopia, cataracta complicata, and in cases of cataract associated with glaucoma in eyes that had previously been subjected to iridectomy or iridosclerectomy. (15) An important adjunct to a successful cataract extraction is confidence on the part of the surgeon as he proceeds in the successive steps of the operation. The technique described herein effects a correct corneal section, proper insertion of the sutures, and full exposure of the iris and cataract, factors that put the surgeon, en rapport, so to speak, with the case.

Summary

An operation for cataract is described in which the corneal flap is fashioned by an incision from without inward and perpendicular to the plane of the globe. The advantages of the procedure are enumerated and explained. The instrument employed is a short Bard-Parker handle and an attached blade which is keen, inexpensive, and replaceable.

855 St. Marks Avenue.

A NEW GONIOTOMY LENS

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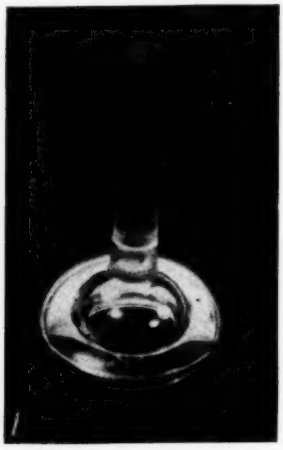
From the time the first lens was introduced for gonioscopy or goniotomy to this date no significant change in its design had been made.[1] After using the standard lens for goniotomy, this writer decided that the method was not at all practical, and either must be radically changed or discarded. Incision in the chamber angle without direct observation had been performed, but this seemed to the writer to be too dangerous and uncertain of results. Dr. Otto Barkan[1, 2, 3] of San Francisco has contributed greatly to the knowledge of the anterior chamber angle, and highest tribute must be paid to him for his meticulous and exhaustive work, and his reintroduction and modification of the technique of goniotomy. He was especially interested in congenital glaucoma which, in brief, he explained in the following manner: In the early stages of the development of the eye the anterior chamber angle was filled with tissue. This persisted in lower animals, as the pectinate ligament. In the normal human eye this was not present, but in eyes in which this tissue did not disappear the corneoscleral trabeculum was covered over and blocked. With the gonioscopic lens the corneoscleral trabeculum and even the internal annular ring were obscured. It was readily understandable that this tissue would interfere with aqueous drainage.



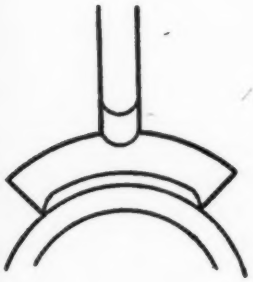


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Fig. 1 (Ellis). Plastic gonioscopy lens. Fig. 3, diagrammatic cross section of new lens resting on the cornea.

In his first experimental work the writer, remembering the first ophthalmoscope and using a glass slide with a drop of water on the cornea, repeated the procedure on enucleated rabbit eyes. The chamber angle could be clearly seen, and that the incision was made into Schlemm's canal was proved by microscopic section. The enucleated eyes were small, soft, and pliable; thus a large area of the cornea could be flattened. Owing to the more rigid structure of the human eye, this

* Now in the Armed Forces.

procedure could not be used on the living person.

With a regulation plastic gonioscopy lens (fig. 1) in place, the top surface area needed for observing one quarter to one third of the human chamber angle was outlined with a glass-marking pencil. This area was egg-shaped and measured about 15 by 18 mm (fig. 2a). By leaving the top surface this size (with the handle near the small end), and grinding the edges angled sharply in (fig. 2b), most of the central area of the concave or inner surface remained (fig. 2c).

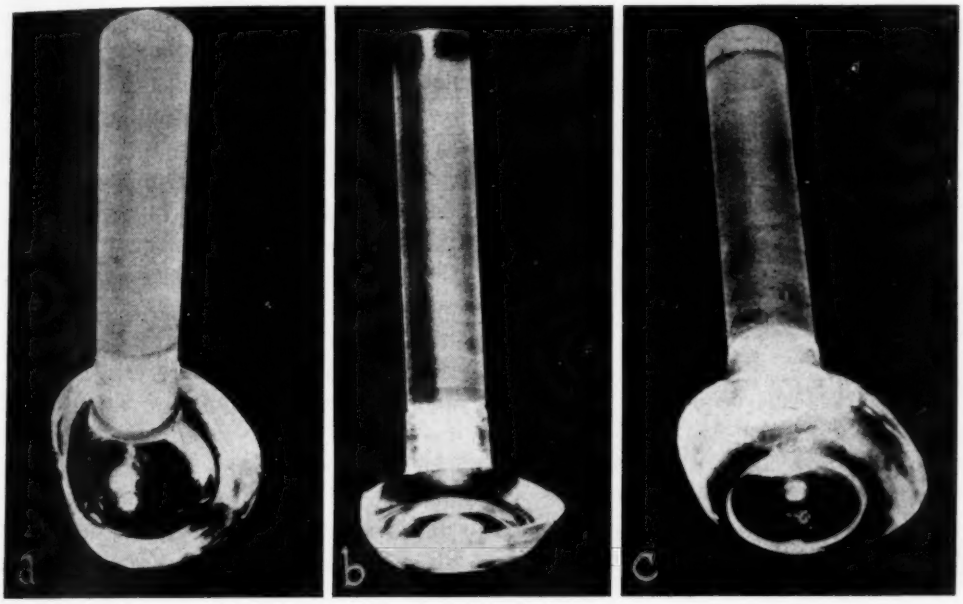


Fig. 2 (Ellis). a, top surface of new goniotomy lens; b, side view of new goniotomy lens; c, bottom surface of new goniotomy lens.

Next the inner curvature was reground to −40D. For the excised rabbit eyes this was found to be a definite improvement, and was used in the operation on the left eye in case 2. Saline was used between the lens and the cornea for the operation. Considerable corneal striation was present which somewhat obscured vision. It was obvious that the inside curvature was too flat, and a wax mold of this inner surface was made and covered with nail polish so that the power could be read directly with the keratometer. This reading was 27D. The corneal curvature of an enucleated rabbit eye was measured and found to read about 30D. This was the answer to why the lens gave excellent experimental performance, but did not work well on the human eye.

A plaster mold was made of the unchanged inner surface of a plastic goniotomy lens. The central curvature measured −75.62D., and near the edge (not the outer lip) the curvature varied from −76 to −92D. Again by using the wax-mold technique, the central area was found to have a keratometer reading of 42D.

The top surface of a second plastic gonioscopy lens was cut down and the edges were angled in as previously described. The inner curvature was left unchanged, and measured 9 mm. in di-

ameter. The sharp edges were smoothed and all surfaces polished. Another advantage was now apparent. Owing to the fact that the curvature of the inner surface of the lens increased near the edge, the outer rim of the new lens would be the portion resting heaviest on the cornea (fig. 3), so that abrasions would occur chiefly near the periphery, and least at the center of the cornea where clear visibility was imperative.

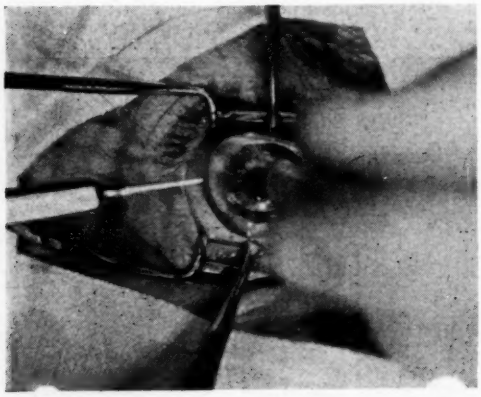


Fig. 4 (Ellis). Goniotomy with the new lens. The knife is entering the cornea.

During this experimental work it was found that often, after the anterior chamber was deepened by injecting saline, even though the knife entered the cornea at an oblique angle, the fluid would leak out and the anterior chamber would again become shallow. Special needles with a stop half way up the shaft of a one-half inch, #27-gage hypodermic needle were devised. With this needle on a 2-c.c. syringe filled with equal parts of saline and water, an assistant could readily keep the tip of the needle in the anterior chamber, maintaining it at a proper depth.

In the preoperative care and immediately before surgery prostigmine was used, as this had been found to be the most effective miotic in buphthalmos and juvenile glaucoma.

For illumination two Shahan lamps were used at the level of the patient's eye angled in at 45 degrees with their light beams superimposed on the field. The surgeon's eyes should be nearly at the same level as the patient's eye. Adequate magnification was secured with a Zeiss telescopic loupe.

General anesthesia was used in all cases, ether for the infant and intravenous sodium pentothal for the two juvenile-glaucoma patients. To avoid corneal damage no local surface anesthesia was given. Novocaine was injected subconjunctivally, superiorly and inferiorly, at the areas of fixation in the two juvenile-glaucoma cases. The anesthetist was informed when the surgeon was ready to enter the eye, so that the anesthetic could be deepened for the duration of the incision.

In the operation, a lid speculum was put in place; then the assistant grasped the conjunctiva firmly at the limbus with two broad conjunctival forceps at the 6- and the 12-o'clock position. The eye was flooded with saline, and the new lens was placed directly on the cornea. The operator held the lens in the left hand, and adjusted it so that the chamber angle was clearly seen. Since the lens angled sharply from the cornea, ample room remained for the introduction of the goniotomy knife (fig. 4).

The knife entered the cornea just above the corneoscleral junction at the temporal horizontal meridian. It was important that the cutting side of the blade should face to the left. The knife entered the anterior chamber, crossed the center, and entered the chamber angle still on the horizontal meridian. The angle was now incised with a counterclockwise sweep to the left. For the right eye the incision was from the 3- to the 12-o'clock position, and for the left eye from the 9- to the 6-o'clock position. In each instance a small amount of blood came from the area of incision in

the chamber angle. About one quarter of the length of Schlemm's canal can be incised in this manner. In these reported cases, incision was made into the pectinate ligament, since this tissue obscured view of the corneoscleral trabeculum.

Postoperatively eserine ointment and eye pads were applied to each eye and the patient was placed on the side with the eye that had been subjected to surgery in the dependent position. In this manner the blood remained free of the operative wound.

For all the experimental work a Ziegler discission knife was used, and even though in some instances the anterior-chamber fluid was mostly lost, at no time was damage to the lens or iris observed. In brief, it is the opinion of the writer that any small knife with a sharp point for ready entrance into the eye would be adequate.

The writer performed the goniotomy operation on three patients, whose records follow:

Case 1. Baby J. B., male, white, 10 months of age, was observed by the mother to have poor vision about six weeks previously. The latter stated that he had never grasped nor played with any objects (toys, rattles, and the like) as normal children usually do. He had made no attempt to sit up or move about. The birth had been spontaneous, without complications.

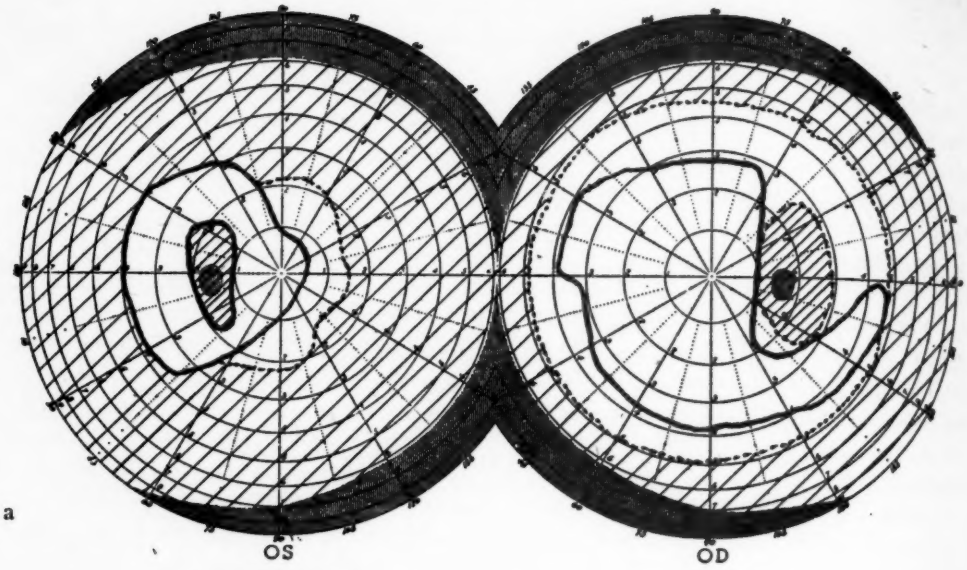
In the examination it could not be definitely determined that the baby had light perception. No attempt to grasp or follow a light was made. The child had the blank look of the blind. The corneas were clear and measured 13 to 14 mm. in diameter. The pupils were average in size (three to four millimeters) and reacted slowly to light. Under anesthesia the discs were seen to be pale, excavated, and the vessels were displaced nasally. The tension with Schiötz tonometer was 23 mm. Hg in each eye. Prostigmine, 5 percent, was prescribed to be used in the eyes, one drop every hour for four doses, then one drop every four hours.

A second ophthalmologist confirmed these findings on the following day. The baby was seen five days later, when light perception was definitely present, the eyes following the light. The pupils were small and well under prostigmine. Tension in the right eye under ether anesthesia was 28 mm. Hg, and in the left eye, 24 mm. Gonioscopy was performed, and the chamber angle at all points in both eyes was seen to be blocked with tissue, as had been anticipated.

On February 17, 1943, a goniotomy was performed with the glass operating lens, the Barkan technique[4] being employed, and an incision was made into the chamber angle of each eye. Following each procedure a small amount of blood came into the anterior chamber from the area of the incision.

The postoperative course was complicated by an upper respiratory infection, but was otherwise uneventful. Prostigmine drops were used in each eye for four months. The tension was taken at short intervals for five months postoperatively, and the readings were 17 mm. Hg or less in both eyes. Three months after surgery the mother proudly stated that the patient was starting to walk and was rapidly catching up to his normal stage of development. The child's eyes were bright and, except for the increased corneal diameter, appeared normal.

Case 2. Mrs. C. M. M., female, white, aged 22 years, was seen through the courtesy of Dr. L. Bramwell on May 7, 1943. She stated that headaches had begun six years ago, with occasional attacks of blurred vision. Headaches had increased in intensity and frequency and had become severe in the past 1½ years; also for this time she had noted haloes around



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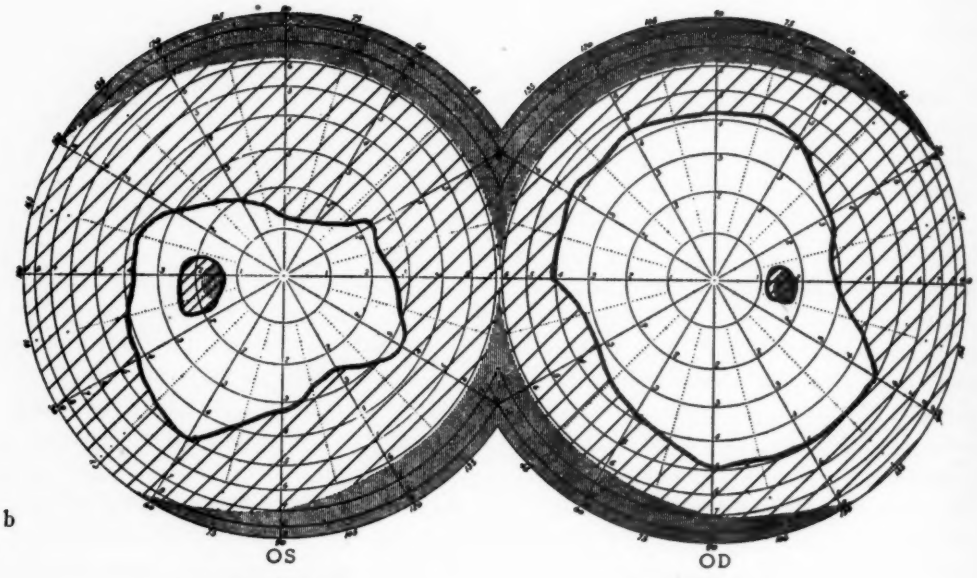

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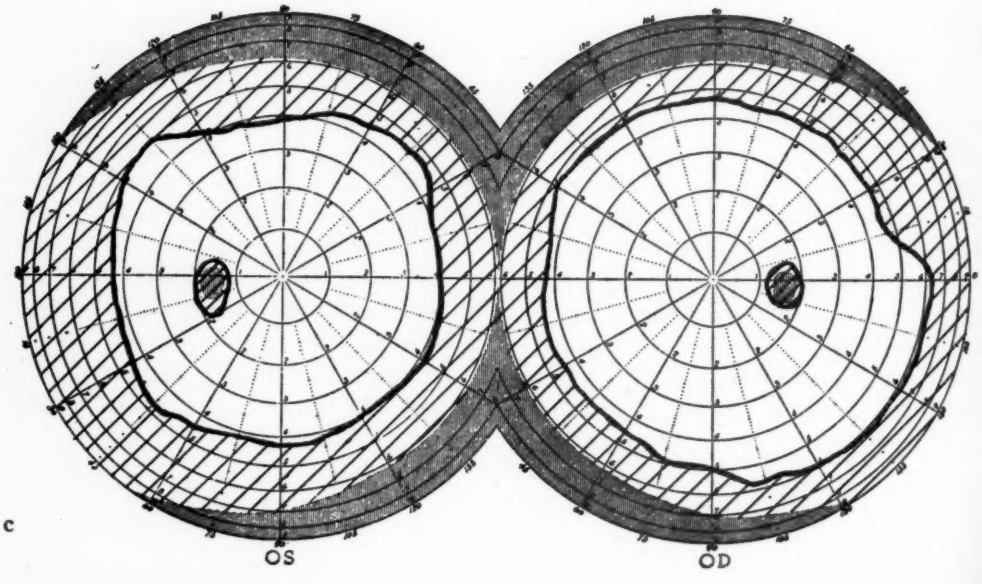

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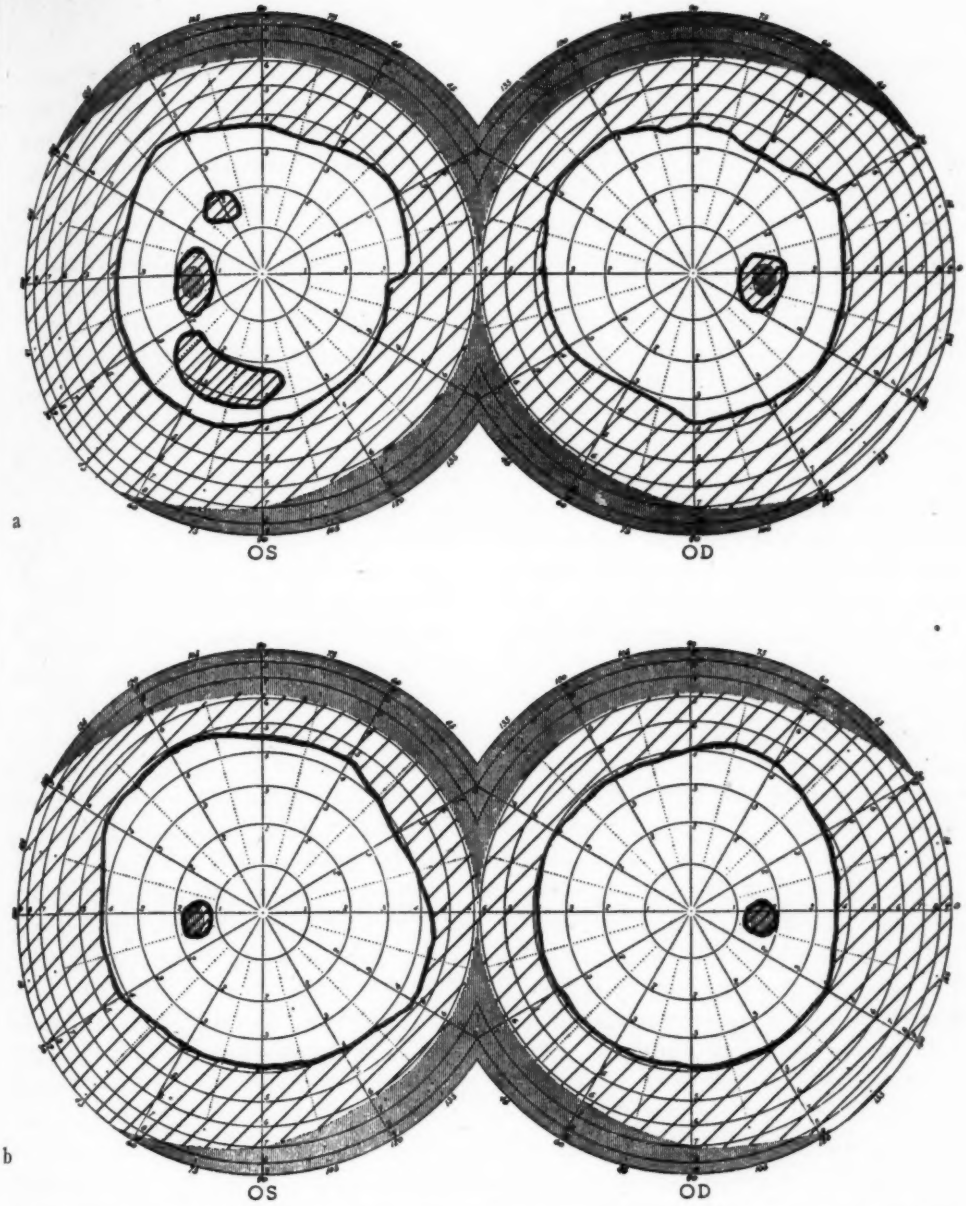

Fig. 6 (Ellis). Visual fields in case 3. a, fields as of June 25, 1943, preoperative, target 2/1,000; b, fields as of July 20, 1943, postoperative, target 2/1,000.

Fig. 5 (Ellis). Visual fields in case 2. a, fields as of May 7, 1943, preoperative. Solid line, 2/1,000 target; dotted line, 6/1,000 target. b, fields as of May 24, 1943, postoperative. c, visual fields as of June 7, 1943; both postoperative fields taken with 2/1,000 target.

lights. Two-percent pilocarpine had been used for the past two years, but for the last eight weeks was no longer effective. Prostigmine had been prescribed, but was soon discontinued because it induced extreme discomfort. The patient's general physical condition was reported to be without significant findings. Dr. Bramwell reported that the tension had been 30 mm. Hg in each eye on three different visits to his office over a period of six months.

In the examination the vision of the right eye was 20/40 not improved with glasses. Vision of the left eye was the ability to count fingers at two feet, which was improved to 20/50 with glasses. The eyes were externally normal in appearance. Fundus examination showed discs of a good pink color, with small physiologic cups. The blood vessels were not displaced. Visual fields were recorded as shown in figure 5a. Slitlamp examination was without significant findings. Examination with the gonioscope lens showed the anterior-chamber angle to be entirely filled with tissue. The internal annual ring could not be seen. Tension in each eye was 13 mm. Hg. On May 12, 1943, goniotomy was performed on the left eye with the first lens described. It was found to be a vast improvement over the Barkan technique, but due to the corneal striations, induced by the flat curvature, was not perfect. Three days later the operation was done on the right eye, and the second lens was used. The ease with which the procedure was carried out with a large portion of the blocked angle clearly in view contrasted markedly to the difficulties encountered when the original glass operating lens was used.

Two days later the tension in each eye was 9 mm. Hg. Nine days after the second eye was operated upon the vision had improved, and both fields showed a large increase in size. Prostigmine drops postoperatively did not cause the cramping experienced before surgery, and were used regularly in each eye. Later it was suspected that the intraocular pressure was rising occasionally, and a 24-hour tension curve was taken. Following the use of either pilocarpine or prostigmine the intraocular pressure was found to rise. All medication was discontinued, and the tension taken at numerous occasions since then had been 13 mm. Hg. Visual fields taken after surgery are reproduced in figures 5b and c.

Case 3. H. G., male, white, 15 years old, complained of headaches beginning at 6½ years of age. Vision had been occasionally blurred, and he had been unable to read with comfort for the past three years. Headaches were frequent, usually daily, and he had noted that with severe headaches his vision was definitely blurred. He had not noticed any haloes. His mother had observed three years ago that the corneal diameter of both eyes was larger than normal. Numerous oculists had been consulted, but the proper diagnosis had not been made.

In the examination the vision was 20/15 in each eye. The visual-field finding was recorded as shown in figure 6a. The corneas measured 13 mm. in diameter, and the anterior chambers were deep. The external examination was otherwise without significant findings. Tension in each eye was 22 mm. Hg. In the fundi enlarged cups were seen, with a temporal pallor of the discs. The vessels were pushed somewhat to the nasal side. Gonioscopy of the right eye showed many pectinate remnants from about the 3- to the 12-o'clock position, and in the left eye scattered through the angle, with an area especially large at the 1-o'clock position. The angle was not obliterated and in between these areas the internal annular ring and the corneoscleral trabeculum were clearly seen.

On June 20, 1943, goniotomy was per-

formed on the right eye. One quarter of the chamber angle from the 3- to the 12-o'clock position nasally to superiorly was incised, and on June 28th the procedure was repeated on the left eye, the incision extending over one quarter of the chamber angle from the 9- to the 6-o'clock position, nasally to inferiorly. Following the incision in the right eye an excessive amount of blood appeared in the anterior chamber. This cleared completely in about two weeks, and no complications have resulted. Prostigmine was used postoperatively, and the tension has remained at about 11 mm. Hg. The patient has had no headaches since the operation.

Visual fields taken after the surgery are recorded as shown in figure 6b.

No discussion of these cases is needed, for the results are unmistakably clear.

With this new goniotomy lens the chamber angle could be seen as clearly, and over as wide an extent, as with the glass operating or gonioscopy lens. Two changes were made; namely, (1) the obliteration of the water chamber, which was not necessary for magnification, and (2) the reduction in size of the lens. The operation of goniotomy was now far easier, for during surgery with the aid of the glass lens, any manipulation of the eye, fixating or entering the cornea with the knife, caused bubbles to enter the water chamber; thus vision was obscured at the crucial time. This hazard was now eliminated. Also it was not necessary to fill the water chamber with solution, as flooding the eye with saline provided sufficient fluid. The new lens lay directly on the cornea with only a thin layer of saline between the lens and the corneal epithelium; however the duration of the actual incision was so short that the cornea did not have time to become abraded or clouded, and as the lens was applied only once the actual damage was negligible. Experiments were conducted using other solutions between the lens and cornea. It was found that these were unnecessary, and their additional value of buffering action was counterbalanced by the danger of introducing the substance into the eye. Glycerine, castor oil, and other oils were used, but were discarded as without value. It must be emphasized that this modified lens is for surgical use only, not for the prolonged, methodical diagnostic examination necessary in each case of glaucoma.

Summary

A new lens for goniotomy is presented, which, when applied directly to the cornea, greatly simplifies the operation. Three cases are described in which surgery was successfully performed.

References

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SUPPRESSION VERSUS AMBLYOPIA*

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When I began to consider this subject I decided that comparing suppression with amblyopia ex anopsia would be like comparing a cat with a tiger, both belong to the same family and spring from the same source, yet are unlike in their habits and temperaments and must be handled with a different approach.

The generally accepted definition of suppression (as I understand it) is the temporary suspension of seeing in an eye which ordinarily has good vision. The understanding which I have of amblyopia ex anopsia is a habitual suspension of vision which has become constant and thus caused poor visual acuity. The result in each instance is from a similar cause, the incoördination of the two eyes which, without the suspension of vision, would be sufficient to result in diplopia. To avoid the annoying diplopia the brain unconsciously brings about suppression, which if it is constant for any length of time becomes amblyopia ex anopsia. As Dr. H. M. Burian stated in his paper on "Fusional movements in permanent strabismus" (Arch. of Ophth., Oct., 1941), "The urge to avoid disturbing double vision is strong. It is not necessarily a conscious effort. It is present even in small children, and suppression as well as amblyopia is caused by it." A good example of suppression in normal eyes is one's ability to use the ophthalmoscope or microscope without closing the second eye. One learns to ignore the image of the eye which is not using the instrument, a temporary monocular suppression. The eyes and brain do the same thing in squint as a protective mechanism against what would be an upsetting diplopia, as any one knows who has had a paralysis of an extraocular muscle.

In considering suppression versus amblyopia I became interested in trying to find out if one type of squint might be more predisposed to either amblyopia or suppression than another and would fall into a definite pattern, or if squints happen to develop either suppression or amblyopia in a hit-or-miss fashion.

I have attempted to compare 38 cases of squint with equal vision (presumably using some form of suppression) with 38 cases of amblyopia (showing at least three lines' difference in vision in the two eyes). I have classified these as to muscle balance, esotropia or exotropia; as to hypertropia, right, left, or double; as to correspondence, true or anomalous; as to the refractive error, with special attention in cases of anisometropia as to whether the refraction was greater in the nonfixating eye or the fixating one. I have also compared the average age of the onset of squint in the two groups, and have determined ocular dominance.

In 38 cases in which there was equal vision in the two eyes (referred to as the suppression cases for convenience), 20 were cases of esotropia and 18 of exotropia. The amblyopic cases could be divided into 32 esotropias and 6 exotropias. From this it may be deduced that the incidence of esotropia combined with amblyopia is much greater than that of exotropia in combination with amblyopia. The number of esotropias and exotropias in the suppression cases was so nearly equal that it might point to a larger number of exotropias in cases of suppression, considering the fact that we

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find a much larger number of esotropias than exotropias in the general run of squints.

In considering the hypertropias the suppression cases showed 4 right hypertropias, 10 left hypertropias, and 7 bilateral hypertropias, or a total of 21 with some form of hypertropia. The amblyopic cases showed 10 right hypertropias, 5 left hypertropias, and 8 bilateral hypertropias, a total of 23 with some form of hypertropia. This comparison showed such an even distribution of hypertropia between the two groups that it can be assumed in this series at least that hypertropia seems to have little bearing on the development of either one form or the other of suspension of vision.

TABLE 1

38 CASES OF SQUINT WITH EQUAL VISION COMPARED WITH 38 CASES OF SQUINT WITH AMBLYOPIA

	38 Cases of Suppression (Equal Vision)		38 Cases of Amblyopia	
	No.	Percent	No.	Percent
Muscle Balance				
Esotropia	20	53	32	84
Exotropia	18	47	6	16
R. Hypertropia	4	10	10	26
L. Hypertropia	10	26	5	13
Bilateral hypertropia	7	18	8	21
All hypertropia	21	55	23	60
Correspondence				
True	28	74	17	45
Anomalous	10	26	21	55
Refraction				
Hyperopia	14	37	7	18
Myopia	2	5	0	0
Hyperopia & Astigmatism	12	32	11	29
Myopia & Astigmatism	2	5	0	0
Mixed astigmatism	2	5	2	5
Anisometropia (with refractive error greater in nonfixating or amblyopic eye)	6	16	13	34
Anisometropia (with refractive error greater in fixating or nonamblyopic eye)	0	0	5	13
Average age of Onset of Squint	2 years 6 months		2 years 4 months	
	No.	Percent	No.	Percent
Dominant eye				
Right	13	34	16	42
Left	15	40	22	58
Alternate	10	26	0	0

The result of the comparison of the true and anomalous correspondence in the two types of cases is interesting. The 38 cases of suppression presented 28 cases of true correspondence and 10 cases of anomalous correspondence, whereas the amblyopic cases presented 17 cases of true correspondence and 21 anomalous ones, or twice as many anomalous-correspondence cases in the amblyopias. Travers in his article "Suppression of vision in squint and its association with retinal correspondence and amblyopia" (Brit. Jour. Ophth., Oct., 1938) compared 148 cases of normal correspondence with 132 cases of abnormal correspondence and found that in 45 percent of the normal-correspondence cases there was equal vision, whereas in 64 percent of the abnormal correspondence cases there was equal vision. The 76 cases under consideration here compared in the same manner show 45 cases of normal correspondence, in 28 of which there was equal vision, or 62 percent against Travers's 45 percent, and 31 cases of abnormal

correspondence in 10 of which there was equal vision, or 32 percent, compared with Travers's 64 percent. I realize that the latter tabulated many more cases than are being discussed here, but even taking this into consideration it is difficult to understand such a disparity.

Travers has developed methods of mapping out the suppression field on the Bjerrum screen at 1 meter (with a transparent red celluloid shield over one eye of the patient) with a small electric lamp pinned on the screen in a position such that when the eye with the red covering looks at it, the other eye is directed at the central area of the screen. In this way the area is mapped out by having the patient tell when a 1-degree white test object appears red and when it appears white. With a reasonably coöperative patient it is possible to map out this suppression scotoma. Travers also describes a more elaborate method whereby two screens and a mirror are used with a white cross on the screen straight ahead, and a fixation light on the second screen to the side which is so adjusted that when the cover test is used there is no shift in changing fixation from the cross to the light. Travers states that squinters with normal retinal correspondence show little suppression when this test is used unless the visual acuity is low, but that patients with abnormal correspondence will not project the light in the center of the screen after being set objectively with the cover test and will usually show a larger area of suppression.

Dr. John Evans in his article "Scotoma associated with strabismus" (Amer. Jour. Ophth., March, 1929) reports 16 cases of adults whose average age was 25 years, and who gave a history of squint, in which he tested the field by the binocular method with a test object of 0.25 mm. He found an average absolute scotoma 2 degrees in diameter coinciding with the center of fixation and connected to the blind spot by angioscotoma. Dr. Luther Peter in his book "The extra ocular muscles" states that the central scotoma even when profound is a relative one, 2 to 3 degrees in diameter; and that there is a relative increase in the size of the normal blind spot, with the peripheral field in the amblyopic eye smaller than the field of the fixating eye. Dr. J. B. Feldman and A. F. Taylor, R.N., in their paper "Obstacle to squint training—amblyopia" (Arch. of Ophth., May, 1942) studied 68 patients, some of them children with amblyopia associated either with or without squint, adults with amblyopia, some with normal eyes, and some who had had amblyopia and whose vision could be improved to 5/5 with glasses. They found a lower incidence of scotomas as compared with other surveys in the literature. Suppression areas, however, were common and might be found associated with squint without amblyopia. They concluded that a definite opinion regarding amblyopia could not be formed from fields, either as to diagnosis or prognosis, since the highest incidence of field changes which was obtainable was 20 percent.

Field taking in amblyopia is an intensely interesting subject, but one in which there are so many "ands," "ifs," and "buts," particularly in the case of young patients, that I am afraid many of us feel the urge to start doing something about the amblyopia rather than spend time trying to map out the scotoma or suppression area. In the 76 cases we are considering the field findings were not complete enough to be used in statistics.

The comparison of the refraction of these cases came next. The incidence of myopia, hyperopia with astigmatism, myopia with astigmatism and mixed astigmatism was not different enough in the two groups to be significant, but the sup-

pression cases presented 14 instances of hyperopia whereas the amblyopia cases presented only 7. There were 6 instances of anisometropia, with the refractive error greater in the nonfixating eye in the suppression cases, as compared with 13 of the amblyopic patients whose greater refractive error was in the eye with the poorer vision. The suppression cases included none with the refractive error greater in the fixating eye, whereas the amblyopic cases did present five in which the refractive error was greater in the nonamblyopic eye. The significant findings regarding the refraction would seem to be the higher incidence of hyperopia in the suppression cases and the fact that there were twice as many amblyopic cases with a greater refractive error in the nondominant eye compared with the suppression cases.

The average age at the onset of squint was 2 years and 6 months in the suppression cases; the amblyopic cases averaged only 2 months younger, 2 years 4 months. This difference could hardly be considered significant. Worth quoted figures stating that of those who attained 6/6 to 6/12 vision only 11 percent had squinted more than 50 percent of their lives, whereas 97 percent of those whose vision was below 6/60 had squinted for more than 50 percent of their lives. He presented strong evidence of the value of early treatment to prevent amblyopia and stated that with vision reduced to 6/60 in a patient over 7 years of age treatment is unlikely to produce any effect. In the article on amblyopia previously referred to, Dr. Feldman found that if the vision could not be improved when tested with a telescopic lens of 3¼ magnification, the amblyopia never responded to treatment.

Dr. George P. Guibor (Trans. Amer. Acad. Ophth. and Oto-Laryng., 1942) stressed the importance of testing the visual acuity of children at 14 inches, because it enables the examiner to differentiate a true amblyopia from blurred vision caused by an overcorrection of the hyperopia or by an unrelaxed ciliary muscle. We have found many interesting cases among amblyopic patients under treatment in which the distance vision seems to make little or no improvement whereas the vision at near will improve as many as four or five sizes of type. This is helpful in making it possible for the child to read or play games with much more facility at the near point with the good eye occluded.

The final comparison made in these cases was in ocular dominance. The suppression cases presented 13 of right-eyed dominance, 15 of left-eyed dominance, and 10 alternators. The amblyopic cases presented 16 of right-eyed dominance and 22 of left-eyed dominance and, of course, no alternators. Drs. Walter Fink and Brynfelson (Arch. of Ophth., Dec., 1935), in considering "The relation of strabismus to right or left sidedness in 60 cases of convergent strabismus," found that 74 percent of the patients came from left-handed stock, and in 60 percent control had been shifted from the dominant to the less dominant side. These figures seem rather high but perhaps it is because we have failed to consider the question carefully enough in taking the case histories of squints, and it is interesting in this study that there was slightly more left-eyed dominance in both the suppression and amblyopic groups.

The treatment of amblyopia is, first and foremost, occlusion, as nearly complete and constant as the child's situation will allow. The child must be persuaded that making his lazy eye work is an important consideration for him. If he is available for office treatments, flashing on any of the orthoptic instruments while he is looking at bright pictures will help. Games like table tennis,

in which he will make an effort to see, are helpful. The movies can be recommended unless they are so exciting that the child will be tempted to use the good eye. Games which can be purchased in the 5-and-10-cent store are numerous: sewing cards, clay modeling, threading beads, painting, drawing and tracing books, and jig-saw puzzles, to mention a few. To a young child who has never had one, a small blackboard with colored chalk is fascinating, also an easel for finger painting will probably produce a budding Dahl in our midst. The prolific badly printed comic books may prove a boon, particularly for a boy who would have to be forced to sit down to read any other kind of book, and its worst feature, the poor printing, should be an aid in stimulating vision. If the child does not have sufficient vision at first to see to read ordinary type, a plus lens can be added in a clip-on to enable him to start the stimulation of the eye. Of course, as the amblyopic eye is being treated the occluded one should be checked every few weeks, as the vision in a constantly occluded eye may go down somewhat, particularly in young children. If anomalous correspondence exists in association with the amblyopia, the same occlusion is helping both conditions, but this should be explained to the parents, for they will otherwise be disappointed when the vision improves to find that occlusion is still necessary.

The treatment of suppression does not usually call for such drastic methods, and if the angle of squint is small, with no tendency to anomalous correspondence, occlusion is not generally indicated. In working with the patients on the various machines it may be necessary to dim the light before the dominant eye or to stimulate the suppressing one with flashing, but most patients who have equal vision will be able to fuse quite easily if conditions are made ideal for them. If the patient can develop stereopsis that is a step forward of course, for no suppression is possible when depth is correctly perceived. The important consideration is getting the patient in a position to fuse in every day life as soon as possible either by exercises or surgery or both. When the patient has arrived at that happy state he can use a stereoscope with interesting cards, and if he shows a tendency to suppress an eye regularly the lens of the stereoscope before the dominant eye can be lightly smeared with soap. Bar-reading will be found helpful in some of these cases, and although this does not necessarily impose binocular vision, at least once in each line the patient has to use the two eyes, according to Dr. David Wells ("Controlled reading," Amer. Jour. Ophth., June, 1932).

Summary and Conclusions

A survey of 38 cases of suppression compared with 38 cases of amblyopia seen in private practice shows:

1. A greater number of esotropias in association with amblyopia and a probably greater number of exotropias in association with suppression.

2. An equal distribution of hyertropias between the two groups.

3. A larger number of cases of true correspondence with equal vision and a slightly larger number of anomalous correspondence types in the amblyopic cases.

4. Fields in these series were not complete enough for analysis.

5. A higher incidence of hyperopia in the suppression cases, and in anisometropia twice as many amblyopia cases with the greater refractive error in the nondominant eye.

6. The difference of the average age of the onset of squint was only two months between the two groups, not enough to be of significance.

7. A slightly higher incidence of left-

eyed dominance in both groups.

In conclusion a few suggestions to be used in the treatment of amblyopia and suppression are made, as in this day of highly specialized trades and professions the binocular use of the eyes is a great necessity, which many of our young would-be pilots have learned to their sorrow. Whatever we can do to start young children out on the road to correct binocular vision will be an insurance for their future happy lives and useful citizenship.

35 East Seventieth Street.

Discussion

Dr. Beulah Cushman (Chicago): I want to congratulate Miss Enos on the manner in which she has brought this problem forward for discussion, for although we do not have the answers to all the questions of suppression and amblyopia we may take up the problems with a new interest after talking them over.

Miss Gonzalez and I have been using the mirror-screen test as demonstrated by Travers and as Miss Enos described it. We have found it very satisfactory to demonstrate suppression in any part of the field with and without normal retinal correspondence and in amblyopia.

Scotomas were found in the suppressed areas, and the size of the scotoma depended on the visual acuity of the portion of the retina involved. The scotoma was small if the suppressed area was near the macula, and usually only a relative scotoma in the macular area. The scotoma was larger if the projected area was in the periphery of the retina with its poor visual acuity. The scotomas or the suppression areas disappeared as the eyes became parallel or vision improved; therefore, we have called them psychic scotomas. This psychic scotoma is a method of avoiding diplopia and confusion. It is a step further than retinal rivalry, the one eye becoming more dominant.

The suppression found in the so-called accommodative squints is probably the easiest to understand as it is purely ocular. The eyes become parallel with relaxation of the accommodative effort, with or without glasses, and the amblyopia in the poorer eye usually improves as it is stimulated and the suppression area disappears.

Other reasons for the development of suppressed areas may be found by studying the development of posture and visual projection. Duane quotes Lotze, who pointed out that the labyrinthine and neck muscles are the first and primary factors in the development of space localization. Visual projection and visual acuity come later in the child's development and are adjusted to the conditions present. If there is some ocular-muscle or refractive anomaly the head will be tilted and the eyes so directed as to overcome the confusion, and diplopia and suppression will develop in the areas necessary. In eyes with unequal or large refractive errors macular suppression may be necessary to avoid confusion, and amblyopia or poor vision remains.

Therefore, suppression may be the psychic attempt to avoid the diplopia and confusion as the associated refractive and muscular structure determine the area and depth of the scotoma. Amblyopia and suppression have their beginning always in early life, for we know that later in life, in eyes with good binocular vision and fusion, suppression can seldom be obtained should any ocular or muscular anomalies arise.

25 East Washington Street.

THE ORTHOPTIC TREATMENT OF THE PHORIAS*

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Admitting that the phorias are not difficult to treat, are they important? In private practice, we ophthalmologists must consider the problem seriously, since the patients in this group of "ocular imbalances" suffer the greatest amount of discomfort. They will seek out the physician who is consciously treating with means other than only glasses with prisms. The aviation industry has recognized the problem for several years; now industry in general has become conscious of its presence. The work of Prof. Joseph Tiffin and Dr. Kuhn proves that the accident increase definitely is associated with high esophorias for distance and high exophorias for near work. When industrial corporations are including the phorias, of course along with other visual factors, in the examination of all new employees, as well as taking the time to check the old employees, one is almost overwhelmed by the scope of such a program. Industry also is cognizant of the fact that it is far more economical to treat these employees than to train them for other types of work. Certainly it is a virgin field for the present group of orthoptists and presents a good future for one interested in this field of endeavor.

What procedure is to be followed in treating the phorias? First, a careful physical examination, particular attention being paid to the possible foci of infection, such as carious teeth, diseased tonsils, faulty habits of elimination; also the drinking habits. Digressions from the normal have to be corrected before any mode of treatment will be satisfactory. These factors are so important for success that I do not think it unethical for the orthoptic technician to suggest the possibility of such an existing condition when she finds a "slower than normal response" over a prescribed period of time. A physician has never lost a patient by repeating an examination but he has lost patients by not doing it carefully in the first place or failing to repeat his work when a question has arisen that justifies a careful recheck. Following a thorough examination and refraction, a course of treatment is outlined to the orthoptist and the patient. Home treatment alone, even under the ophthalmologist's supervision, is not advocated. Few, if any, physicians have either the temperament or the time necessary to devote to the details of instruction and procedure that are required. I have obtained excellent results and a most satisfactory patient relationship working in conjunction with a well-trained technician. Under her observation and guidance, the patient is much less apprehensive, more at ease, his interest is sustained, and full coöperation is secured. In this manner, the office procedure and home work are closely supervised, and faulty habits are quickly eliminated.

Complications of the phorias, such as alternating or monocular suppression, present in many of the exophorias for near and convergent insufficiencies, have to be broken down before the duction can be improved. This can be done satisfactorily with the red glass and the reading bar. With the complication cleared away, the phorias are best treated with a major amblyoscope. In exophorias and convergent insufficiencies, we use the flag series which have print to stimulate accommodation, believing that we can build up ductions more rapidly in this way.

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* Read before the fourth annual Symposium on Orthoptics, at Chicago, October 10, 1943.

Later, we replace the stereoscopic slides, using the smaller targets. In esophorias and hyperphorias, we use stereoscopic slides exclusively. Once the patient understands what is expected of a normal pair of eyes, home treatment with prisms and graded stereoscopic slides can be satisfactorily employed. In the simpler convergence insufficiencies, approximation exercises alone are adequate to relieve symptoms. However, in all forms, I believe stereopsis is an added benefit which promotes a more permanent result. The uncomplicated exophorias require 6 to 10 treatments to build up sufficient normal duction power. The hyperphorias require a longer time and vary more in their response to treatment. One should be most cautious of committing himself to any stated time factor in any type of case.

The standards taken for the discharge of a patient are normal duction balance, fusion, and stereopsis.

In closing, I should like to say that the orthoptist treating phorias should have the opportunity of reëxamining these patients to observe how completely comfortable and symptom free they have remained.

Conclusions

1. "Phorias" are important.
2. They respond readily to treatment.
3. They form a group of your most satisfied patients.

435 Fifth Avenue.

Discussion

Elsie H. Laughlin (Iowa City): Dr. McCaslin admits that phorias are not difficult to treat. In comparison with tropias this is true, as many heterophorias are asymptomatic and require no treatment. On the other hand, some cases may require surgery and prisms before symptoms are relieved.

In our experience there are at least two important factors in determining ocular discomfort. The first is the relationship between the amount of heterophoria and the patient's reserve of fusional power after overcoming it by fusional movements. It is not uncommon to find asymptomatic patients with large degrees of heterophoria. They are not uncomfortable because they have a reserve of fusional movements. For example, a routine aviation examination revealed that a pilot had 8 to 12 prism diopters of hyperphoria with cover test and Maddox rod. He was able to overcome this deviation easily; consequently, he had no complaints, single binocular vision, and stereopsis according to standard tests.

A second factor is occupation. Recently in our clinic an analysis was made of heterophorias in two large occupational groups: farmers and university students. The incidence of ocular discomfort in association with heterophoria was many times greater in the student group, although the incidence of heterophoria was only slightly greater.

There are other factors, but in the average case of heterophoria the part played by poor health habits and foci of infection is controversial, although no one will question that systemic disability is important in some cases. Dr. McCaslin has stressed the necessity of making a careful examination before orthoptics is prescribed. Members of our medical staff question the need for a general physical examination and check for foci of infection in every case.

The necessity for careful refraction cannot be overemphasized. For example, we find a considerable number of convergence insufficiencies associated with uncorrected or undercorrected myopia. In

many of these patients, convergence ability improves when the full myopic correction is prescribed; consequently, it has been our policy to give them a trial of several weeks or months with proper glasses before initiating orthoptic training.

I agree with Dr. McCaslin that in an occasional case accommodation may be an aid in developing convergence, but routinely I find it simpler to teach patients to converge without accommodating; that is, with the instrument adjusted for infinity. Usually there is less fatigue and therefore better toleration of convergence exercises. In some cases it is essential to teach convergence without accommodation; for example, in convergence insufficiency in patients wearing bifocals.

Our technique with all convergence insufficiencies, then, is to begin with simple targets on the major amblyoscope. The rotor control of flashing tends to stimulate recovery as well as steady fusion. Many people follow a moving object well to an acceptable convergence near point, but recovery of a single image at any point after fusion has been disrupted is the crucial test and more nearly parallels the patient's subjective experience. Another advantage of the major amblyoscope is that the eyes and position of the head can be watched constantly.

When the simple targets are mastered, they are supplemented with stereoscopic charts in which stereopsis is an added incentive for fusion. The "jump" targets of the Keystone Delta Base Out series are especially good and may be used in the prism stereoscopes.

The results obtained with orthoptic training in uncomplicated convergence insufficiency are excellent. Often associated hyperphoria and cyclophoria of small degrees are lessened when horizontal fusional movements are well developed.

I agree with Dr. McCaslin that it is unwise to commit oneself to a stated time factor in any type of case but the greater share of our patients, like his, obtain relief with 6 to 10 treatments.

Probably no profession finds its terminology more confusing than that of orthoptics. In a recent article Dr. Lancaster has called our attention to the importance of establishing standard terminology to avoid confusion. For example, it is not quite clear in my mind just what Dr. McCaslin means by duction balance as a requirement for discharge. According to Dr. Lancaster, ductions refer to monocular rotations whereas vergences describe the fusional movements which are developed by orthoptic training.

Lastly, I would like to mention a group of phorias who are the orthoptist's pride and joy—patients whose tropias have been converted into phorias by orthoptics properly combined with the correction of refractive errors, occlusion, and surgery. They require more treatment than the ordinary heterophoria before comfortable binocular function is maintained under all conditions. However, the fact that these patients have reached the phoria stage is evidence of good coöperation between ophthalmologist, patient, and orthoptist. Without this coöperation, orthoptics would be a much less gratifying field of endeavor.

1630 Wilson Street.

NONCOMITANT HYPERPHORIAS

CONSIDERED AS ABERRATIONS OF THE POSTURAL TONUS OF THE MUSCULAR APPARATUS

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The role of the postural tonus of the extraocular muscles in the physiology of vision has been stressed in a previous communication.[1] There it was pointed out that the fusion-free position, in which one eye fixates while the other is occluded, does not represent a true position of rest and that therefore concepts which have been arrived at through the use of the conventional clinical tests are not safe guides to follow in determining the diagnosis or the treatment of a given case.

The process of fixation is accompanied by minute, rhythmic, involuntary adjusting movements which serve to prevent retinal fatigue by permitting the foveal image to roam over a large number of percipient elements, while at the same time maintaining accurate fixation. The latter is thus associated with a state of heightened tonus affecting all of the extraocular muscles. The fact that prolonged fixation frequently results in symptoms of eyestrain bears evidence to the validity of this statement.

Physiologically considered, the closest approach to a position of rest of the eyes in the waking state would be a vacant stare into space, no attempt being made to discern any objects. However, such ocular posture is of little practical value, since it does not offer a base line from which quantitative clinical measurements may be made.

Since binocular vision arose at a fairly late stage of phylogenetic development, it may be assumed that even in man there are present potential tonus-regulating centers which control the postural muscle-tonus of one eye without reference to the other. Superimposed upon these are the centers controlling binocular innervation, both the tonic and the kinetic varieties. In the normal exercise of binocular vision the monocular influences are held in abeyance, being completely inhibited by the higher centers. Hering's law of equal binocular innervation applies only to those latter centers.

Two types of eye movements are typically associated with an archaic postural pattern. One is divergence, which is reminiscent of the laterally placed eyes in lower mammalia. The other is an upward deviation which may be considered a protective movement and is still normally present as Bell's phenomenon, elicited by closure of the eyelids.

The divergence movement has already been dealt with in the communication to which reference has been made.[1]

In all individuals there is present a potential tendency toward an upward rotation of the visual axes which increases with any increase in the general tonus of the muscular apparatus. Fixation provides such an increase in muscle tonus. If both eyes are fixating, no movement is, of course, possible. However, if one eye, for any reason, does not participate in the visual act, that eye may manifest the updrift. Following are some of the conditions under which this phenomenon may be elicited: (1) Occlusion of one eye. (2) Amblyopia or blindness of one eye. (3) Lack of development of fusion. (4) Obstacles to fusion, such as anisometropia, heterophoria, and aniseikonia.

The amount of hyperphoria present in the nonfixating eye will also depend on

the extent to which the binocular innervation has supplanted and inhibited the more primitive monocular tonus-controlling centers, and on the degree of dissociation achieved by the clinical method employed. The Maddox rod produces more dissociation than a red glass, unless the latter is dark enough to reduce the intensity of the muscle light to a mere glimmer, in which case it is as effective as the Maddox rod, or even more so. The longer monocular occlusion lasts, the greater will be the amount of hyperphoria thus elicited.

It should, however, be noted, that many clinically normal cases, on prolonged occlusion, exhibit analogous phenomena. On occluding one eye for one week, that eye may be found to have developed a hyperphoria. On repeating the procedure on the other eye, the occluded eye need not show a corresponding amount of hypophoria, but may even exhibit a hyperphoria, or an exophoria, or a combination of the two. It is interesting that Marlow,[2] who had advocated his prolonged-occlusion test as an important diagnostic aid, later[3] admitted that it merely produces artifacts which bear no relation to the normal physiology of the ocular movements.

The two most widely circulated theories are the one of White,[4] who ascribes the hyperphoria to a paresis of the superior rectus of the opposite eye, and that of Bielschowsky,[5] who regarded the hyperphoria as a disjunctive vertical deviation arising in some mysterious way from an inequality in the stimulation of the two retinas.

If there is one single characteristic that differentiates a noncomitant hyperphoria from either the comitant or the paretic type, it is the fact noted by Bielschowsky, that the higher eye, even behind a screen, responds with a downward movement whenever a dark glass is placed in front of the fixating eye. This behavior definitely establishes the existence of a relationship between the visual processes of the fixating eye and the muscle balance of the nonfixating eye. Bielschowsky interpreted this phenomenon to mean that the reduced illumination of the retina of the fixating eye results in a disjunctive "vertical divergence." This explanation is purely hypothetical, besides seeming rather forced.

To the writer's knowledge, the view that regards the noncomitant hyperphorias as a synthesis of the primitive monocular tonus-regulators and the higher binocular innervation, has not been stressed either in textbooks or in the literature.

The present communication will be limited to a consideration of two types of hyperphoria; namely, alternating hyperphoria and monocular hypertropia of amblyopic eyes.

Alternating hyperphoria

In patients having normal binocular vision, alternating hyperphoria is frequently encountered either as the sole anomaly or combined with other heterophorias. It may exist in combination with a comitant hyperphoria, in which case the comitance is modified so as to suggest the presence of a muscle paralysis. If the Maddox rod is held before one eye, the hyperphoria is different in amount from what it would be were the rod placed before the other eye. However, the absence of diplopia and the uniformity of the deviation in the various portions of the field of fixation help to differentiate this type of hyperphoria from a lower neuron paralysis. The hyperphoria is entirely abolished or greatly reduced in amount by convergence and accommodation.

A curious case was observed recently in a young soldier who had a congenital amblyopia of the right eye, the vision in this eye being 20/60. The left eye had

normal vision. Both eyes were on the same level when fixating binocularly. Convergence and accommodation were normal. When the right eye was screened, it turned sharply upward 15 degrees, to return to the normal level when the screen was removed. When the left eye was screened, no movement, either up or down, was noted in either eye. The hyperphoria of the right eye was the same in all fields of fixation. This case may be explained as a combination of a comitant right hyperphoria and an alternating hyperphoria. It may also be regarded as a transition stage to the type of noncomitant hyperphoria seen in blind or amblyopic eyes.

The Bielschowsky phenomenon

If one eye is either blind or markedly amblyopic it frequently displays a hyperphoria of varying degree. In these cases, and even in those in which no hyperphoria exists, Bielschowsky was able to demonstrate that the blind eye makes a quick downward movement of about 10 degrees when a dark glass is held before the fixating eye. Even if the dark glass is left in place, the blind eye will slowly return to its former, or almost its former, position. Bielschowsky explained this behavior by assuming that the reduction of illumination of the retina of the fixating eye produces a disjunctive binocular innervation with a resulting vertical divergence. The deviation manifests itself only in the blind eye, since the other eye cannot relinquish fixation. Cords[6] has designated this type of noncomitant hyperphoria as "Bielschowsky's phenomenon," a term which seems appropriate in view of the obscure nature of the physiology involved.

An analogous phenomenon is observed in alternating hyperphoria. On screening either eye, the covered eye turns upward. If now, without changing the position of the screen, a dark glass is held in front of the fixating eye, the other eye makes a downward movement behind the screen.

Author's theory

In a study of a large number of cases of alternating hyperphoria and Bielschowsky's phenomenon, the author has made the following additional observations.

1. If a screen is held in front of the fixating eye, the other, blind eye, makes a downward movement exactly as if a dark glass had been used. An intelligent patient can be easily trained to keep the screened eye in the same position even though fixation is temporarily suspended through the interposition of the screen. This test is more difficult to carry out in alternating hyperphoria, but there the same findings are obtained.

2. If a lighted electric bulb is used as the fixation object and the light is extinguished, no appreciable effect on the hyperphoria can be detected.

3. The interior of the eye may be illuminated by light thrown through the pupil without altering in any way the response to the screening of the fixating eye.

4. By holding a black card in front of both eyes in alternating hyperphoria, or before the good eye in Bielschowsky's phenomenon, so that the fixation reflex is either eliminated or rendered ineffectual, the deviation is found to be greatly reduced in amount or entirely absent.

These observations permit the following deductions to be made:

1. Fixation is at least as important a factor in producing the deviation as the illumination of the fixation object.

2. The deviation varies with the visual activity and not with the amount of light striking the retina.

3. Elimination of the fixation act reduces or even abolishes the hyperphoria.

It appears from clinical observations as well as from the theoretical considerations

discussed in the previous communication[1] that the eye muscles are subject to two types of tonus innervation: (a) The tonus derived from the voluntary nerve supply, which is invariably bilateral and symmetrical; and (b) the reflex postural tonus, dependent on such factors as fixation, illumination, and attention. Fluctuations in attention may play a part in the irregular up-and-down movements that are frequently observed in the blind eye while the other eye stares at a fixation object. At any rate, whatever the cause may be, these spontaneous oscillatory movements reflect the continuous play of tonus-regulating forces upon the entire musculature of the eye.

Fixation and illumination tend to heighten the tonic activity (tension) of all eye muscles. In all persons there exists a tendency—archaic in origin, as expressed in Bell's phenomenon—for the eyes to turn upward. The greater the muscle tonus, the greater this upward drive becomes. In a large percentage of people the binocular linkage is loose enough to permit a greater or lesser degree of dissociation of the two eyes. Naturally, when one eye has been blind or amblyopic since childhood, the binocular functions are rudimentary and the dissociation is quite marked. Hence, fixation by one eye results in a tendency to upward deviation of both eyes, this tendency becoming manifest only in the nonfixating eye, and only to the extent that the laxity of binocular innervation permits. It may be easily seen that by prolonged monocular occlusion the maximum degree of dissociation is obtained, and it is not surprising to find vertical deviations in a majority of cases, differing in degree and in kind, depending on which is the occluded eye.

An interesting thought suggests itself in this connection, though not bearing directly on the subject at hand. Miners' nystagmus is induced by absence of fixation and lack of light, and it is inhibited by convergence. These factors are the same as enter into the genesis of alternating hyperphoria. Fixation is associated with rapid, minute, involuntary adjusting movements. When the factors affecting muscle tonus are reduced to a minimum, it is conceivable that these adjusting movements become so slow and coarse as to deserve to be classed with nystagmus.

Since fixation by one eye is a relatively primitive function, it may produce a primitive tonus-response which, like Bell's phenomenon, is originally a protective reflex, and does not necessarily bring the binocular motor apparatus into play. When, however, higher visual requirements are thrown upon the ocular apparatus, such as fusion, convergence, or accommodation, this primitive reflex tonus is inhibited and perfect binocular function is established. This state of affairs may be observed in alternating hyperphoria. Even if either eye may drift upward spontaneously on distant gaze, the hyperphoria is inhibited on convergence and accommodation.

Summary

1. Alternating hyperphoria and noncomitant hypertropia of blind or amblyopic eyes (known also as Bielschowsky's phenomenon) have been variously interpreted as due to superior rectus paralysis and as a "vertical divergence" elicited by visual processes.

2. An attempt has been made here to explain these conditions as aberrations of the postural tonus-mechanism of the extraocular musculature.

3. According to this concept, voluntary binocular control of ocular movements has been superimposed upon an archaic tonus-regulating pattern that does not obey Hering's law, and that manifests itself to the extent to which any laxity of the binocular linkage will permit a dissociation of the two eyes.

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ON THE MORBIDITY OF TRACHOMA

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A characteristic of every infectious disease is its morbidity; that is, the sick rate, or proportion of disease to health in a community in which every member has the opportunity to be infected. Most infectious diseases show a wavelike change of morbidity; for example, influenza is supposed to have a peak in every 30 years, diphtheria in 8 to 10 years. We do not know about such oscillations in trachoma. Its occasional spread is due to the greater possibility of contact infection. In this way trachoma was contracted by soldiers partaking in the Napoleonic campaign in Egypt in 1798-99, and they spread it in several European countries after returning to their homes. Such a spread can be observed on a small scale when the migratory laborer infects the members of his family. He contracts the diseases from his fellow laborer in the summer. This mode of infection has a great significance in Hungary. According to data I collected at the University Eye Clinic in Pécs, Hungary, 23 percent of trachomatous patients contracted the disease from other agricultural laborers and 33 percent acquired it from members of their own families. The same observation has been made in another part of Hungary, as in the county of Mezökövesd, where also the two main sources of trachoma are the family and the group of agricultural laborers.

Our knowledge of the morbidity of trachoma is somewhat meager, although there are abundant statistics on the distribution of trachoma. Twenty-five reporters contributed statistics at the Thirteenth International Ophthalmological Congress at Amsterdam,[1] 1929, concerning the distribution of this disease throughout the world. Wibaut[2] collected these data and made a trachoma map of the world, for which he deserves our gratitude. However, the figures of the map are based on the study of very different groups, nine in all; for example, distribution of trachoma among school children, recruits, samples of population, and in eye clinics.

Only if every member of a community has the opportunity to become infected is it possible to determine the morbidity of a disease. This is easy in the case of measles or influenza, for these spread through serial infection; moreover, a single exposure is sufficient to contract them. Trachoma, on the other hand, being a contact disease, spreads in communities whose members live continuously and intimately together. It is probably only exceptionally contracted from a single exposure. Such communities are found

among the poorest farmers in southeastern Europe. Each family uses the same washbasin and towel, sleeps in two beds, and lives in one or two rooms. There is a very great possibility that the infection is spread from the diseased eye by the fingers, handkerchief, by water used for washing pillows, and so on. In Mezökövesd (northeastern Hungary) I examined 12 families infected with trachoma, and found 41 members out of 70 suffering from the disease (58.5 percent). But these families, because they were so severely affected, were purposely selected by the local trachoma doctor. In the same village practically all the inhabitants have been examined by the local physicians. In two districts—one half of the village—308 (33.9 percent) out of 908 members of 165 families suffered from trachoma. Data collected from trachoma patients treated at the University Eye Clinic, Pécs, Hungary, showed 137 (34.4 percent) out of 398 members of 76 families as diseased. In trachoma-afflicted families it may take several months or years before another member of the family shows signs of trachoma. In this series only those individuals could be examined who came to the Clinic. The condition of other members of the family was necessarily determined by the testimony of those examined, and that is very unreliable. Even the reports of these previous investigations in Mezökövesd, where diagnosis was made by several physicians, do not give the real number of diseased persons. We know there is no single symptom that determines the diagnosis of trachoma beyond doubt. In all such examinations the personal equation of the examiner must be considered.

In a second series of investigations this factor was excluded by considering only families whose members had inclusion bodies. In addition to trachoma, these are found in the paratrachoma diseases: inclusion blennorrhea, inclusion conjunctivitis, swimming-pool conjunctivitis. But these diseases can be differentiated from trachoma. Swimming-pool conjunctivitis is contracted in pools; inclusion blennorrhea of the newborn cannot be confused with trachoma, because the newborn has no trachoma. The only paratrachoma disease to be confused with trachoma is inclusion conjunctivitis of the adult, but this disease is rare, acute, and for the most part monocular. Thus, if inclusions are found in the conjunctiva in a case of chronic conjunctivitis in a trachoma country, the disease is considered to be trachoma, even if the clinical symptoms are doubtful. Excluding the paratrachoma diseases, the finding of inclusion bodies makes the diagnosis of trachoma certain. Seventy-one (42.3 percent) out of 168 members of 28 inclusion-positive trachoma families suffered from the disease.

Some other statistics available also throw light on the morbidity of trachoma in Hungary. Lénard[3] examined the whole population of several severely infected villages and found the incidence of trachoma cases to be as follows: Tótszentmárton 35.5 percent, Molnári 35 percent, Sömjénháza 33 percent. He also found 1,509 cases (30 percent) out of 5,079 inhabitants of the county of Letenye, the southwestern corner of Hungary. These are the most heavily infected villages in that country, and nearly all the families are involved. The percentages show strong resemblance to the figures found by us.

The situation is a different one in Egypt. It is known that practically all the natives acquire trachoma. Wilson[4] (1929) examined the inhabitants of the village of Bahtim. Out of the total population of 3,540, 491 could not be reached and 140 were under one year of age. Those examined showed the following condition of conjunctiva. Trachoma I, 20.6 percent; Tr. II, 1 percent; Tr. III, 72.4 percent; Tr. IV, 3.6 percent; acute

conjunctivitis 2.4 percent. Subtracting this last group, which might contain trachoma cases as well, all persons examined were diseased. Twenty-five percent of the babies under one year of age showed trachoma. It can be stated that trachoma has a morbidity of 100 percent under the social, climatic, and racial conditions of Egypt. Searching among the data of reports prepared for the Amsterdam Congress, only the paper of Miyashita[5] (Japan) gives statistics concerning the distribution of the disease in the families, and number of diseased families in a village.

These statistics indicate (supposing the number of members in families with and without trachoma to be the same on the average) that 30 to 60 percent of the members of trachoma families suffer from trachoma. From another table given by Miyashita, showing data from the same writers, the family incidence is about 30 to 50 percent.

Author	Number of Examined Families	Number of Infected Families	Percentage of Infected Families	Percentage of Trachoma among the Population of the Village
Maruo	998	470	47	14.1
Kumamoto	502	363	72	31.4
Wakisaka	100	80	80	43.6
Nara	4.695	3.791	81	48.3
Aomori	89	76	85	48.8

It remains a subject for discussion, whether the nonafflicted members have an absolute or relative immunity. Some of the individuals may have an abortive form of the disease. Another group is exposed to infection at an advanced age, when immunity seems to be higher. Trachoma is more easily contracted by a child than by an adult. The abundant lymphatic tissue of the child, and its atrophy in the adult may have an influence on that fact. As to the role of race, I quote MacCallan[6] "No race of mankind is immune from trachoma, all suffer equally when exposed to the same conditions of contagion, filth, and over crowding." These conditions are very different in different countries.

The main source of infection with trachoma is the family. This mode of spreading the disease causes the hardest problem in the fight against it. The measures generally accepted are fairly effective, such as periodic examination of school children and recruits, treatment, hospitalization, and so on, but the main source cannot be reached unless the general welfare and hygiene of the poorest is improved. Wibaut[2] summarizes it in this sentence, "the countries most affected are the poorest."

The most important measure in the fight against trachoma is its treatment. A few years ago it was to be hoped that sulfanilamide was the specific drug, but by now over two scores of publications show a wide divergence of opinion concerning its effectiveness. The first publications were enthusiastic about its specific action, but by now several are skeptical of its curative effect, and others admit that only a small number of patients respond to sulfanilamide. Julianelle and J. E. Smith[7] subjected trachomatous tissues *in vitro* to different concentrations of sulfanilamide. The tissues were then tested for infectivity. "Under these conditions, it was not possible to demonstrate that sulfanilamide has any appreciable effect on the infective capacity of the virus of trachoma." Very correctly they remark that "conditions in vitro are not identical with those in vivo," although, under their experimental set-up,

very similar. On the other hand, it seems to be highly significant that the inclusion bodies disappear from the conjunctiva in three days, when the patient is treated only with the drug *per os*, as Thygeson[8] found to be the case in 16 instances of inclusion-positive trachoma patients. In this part of the country trachoma is very rare. In 5 years, the author has seen only three inclusion-positive trachoma cases. In all three cases there were no inclusions to be found on the fourth day, after sulfanilamide administration only, without any local treatment, thus confirming Thygeson's observation. In six weeks the trachoma was cured clinically in all three cases. The drug was given for two weeks, with an interval of one week. Six weeks seems to be a long time for a cure by a "specific" drug, but it cannot be expected that the deep histologic changes of the conjunctiva, lymphocytic and plasmacellular infiltration, follicles, and papillary hypertrophy would disappear as soon as the infective agent is destroyed.

The same is true for the disappearance of luetic changes under specific treatment. Spirochetes disappear from the primary luetic lesion in 48 hours, when the patient is treated with arsenicals, but it takes several weeks before the lesion is healed; and this is in the acute stage of the infection. It takes about two months before a gumma clears up under specific treatment. If the inclusion body is the conglomerate of the virus, or if it indicates the presence of the virus, and thus the infectivity of the case, it is to be hoped that sulfanilamide or some even more effective sulfa drug will prevent the spread of the disease. An inclusion-positive trachoma case should be hospitalized for the first series of sulfanilamide treatments.

Summary

Only in communities in which members of families live under very crowded and poor hygienic conditions, can the real sick rate of trachoma be determined, because of the chance of repeated and massive contacts. The morbidity is 100 percent in Egypt, 30 to 60 percent in Japan, and was found to be 30 to 58 percent in Hungary, 42.3 percent in inclusion-positive trachoma families. Certain individuals and old persons have a relative immunity, but no race is immune from trachoma. The main source of trachoma is the family, and in southeastern Europe the migratory laborer.

General welfare and hygiene help in the fight, as is well known. But the most important weapon is the treatment. The disappearance of the inclusion bodies from the conjunctiva in a few days, when sulfanilamide is administered, makes us hope that the infectivity of the individual can be quickly suspended, and thus the danger he represents be eliminated for family and country.

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NOTES, CASES, INSTRUMENTS

SIMPLE EQUIPMENT FOR DETERMINING OCULAR-MUSCLE EFFICIENCY

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Phorias may be uncovered and measured and fusion efficiency evaluated in various ways. The following equipment and techniques have been employed by the writer for the past 10 years. The equipment is compact and inexpensive and the technique is sufficiently accurate for all routine ocular-muscle-efficiency tests.

The equipment consists of a red multiple Maddox rod encased in a wooden eye screen (fig. 1) and a set of loose, square prisms. In addition to the multiple Maddox rod the eye screen is equipped with a handle, the end of which terminates in a white ivory sphere; a V-shaped shoulder below the Maddox rod to support the prisms and assist in the proper placement of same, and a peep or pinhole 1 mm. in diameter. The white sphere is employed for fixation purposes and rough visual-field determinations, and so forth. The shoulder serves as a support for the prisms employed to measure the phorias uncovered and obviates the necessity of closely scrutinizing the prisms and screen to insure proper placement. The 1-mm. peep hole is employed in the "peep hole" or "pinhole" test preliminary to refraction, to determine whether or not vision is correctible. The screen itself serves as an ordinary eye screen to exclude one eye when testing monocular vision, and the like.

The shoulder and the axis of the Maddox rod are set at an angle of 45 degrees to the long axis of the screen. This position permits the examiner to rest his fingers conveniently against the side of the examinee's face and temple, thereby steadying the screen. The position of the line of light is indicated by a white line on the face of the screen, which is at right angles to the axis of the Maddox rod. This line assists the examiner in holding the shield at its proper angle before the eye and is perceptible in a moderately darkened room.

Fig. 1 (Thorne). Eye screen with Maddox rod.

The shield is inexpensive and practically indestructible. If a sufficient number of these shields were placed in each eye-examination unit, all personnel on duty therein could be provided one and each carry it as he does his fountain pen.

Inch-and-a-half square loose plastic prisms are recommended in preference to glass prisms of the same size, as the plastic type is not easily broken. It is true the plastic prism scratches easily, but a considerable amount of scratching can be

inflicted before the prism becomes ineffective. Prisms in strength from 0.5 to 12 diopters are sufficient for all routine muscle-efficiency tests. Round prisms from the trial case may be employed in connection with this shield, but accurate placing of round prisms is more difficult than with the square type, as they are designed to be used in a trial-lens frame. In addition to measuring the degree of phorias uncovered, the square prisms are employed in measuring the efficiency of fusion.

The eye screen with its Maddox rod and square loose prisms can be conveniently carried in a single case constructed for the purpose. With the exception of a spot lamp the entire ocular-muscle equipment will then be contained in a single case approximately 2¾ by 2¾ by 6 inches in size.

Office of the Surgeon General.

MOTILITY CLINIC*

CONCOMITANT CONVERGENT STRABISMUS WITH OVERACTION OF THE INFERIOR OBLIQUE MUSCLES AND DISSOCIATED VERTICAL DIVERGENCE

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Miss A. McC., aged 16 years. Very soon after her birth the parents noticed that her eyes turned in alternately. Particular attention was paid to this, since there was a history of strabismus on both the paternal and maternal sides of the family. The patient was examined for glasses at an early age; the refractive error was found to be low; no correction was given, but the left eye was bandaged for some time.

Eight years ago the patient's neuromuscular condition was thoroughly checked for the first time. Visual acuity was normal in each eye; refraction: R.E. = L.E. = +1.00D. sph. ⊂⊃ +0.50D. cyl. ax. 90°. An alternating convergent strabismus of 20 to 22 arc degrees (40 to 45Δ) was found. The position of the double images in the double-image test corresponded to the angle of squint, and the afterimages in the afterimage test formed a cross (normal retinal correspondence). Adduction in the right eye was excessive and the patient appeared to prefer the left eye for fixation. A guarded tenotomy of the right internal rectus muscle was performed by Dr. Bielschowsky with excellent result.

Certain features which complicate this simple picture were noted when the patient was first seen; they have not changed to this day.

DIAGNOSIS

At present the refraction and visual acuity are: R.E. −0.50D. sph. ⊂⊃ −0.75D. cyl. ax. 15° = 20/20 −2; L.E. +1.25D. sph. ⊂⊃ −0.50D. cyl. ax. 180° = 20/20. The wearing of the glasses does not noticeably influence the position of the patient's eyes, but it gives her comfort for close work and at the movies.

The patient appears to have binocular fixation for distance; the right eyeball is possibly slightly protruding. However, at times the right eye turns slightly in and up; occasionally, though much more rarely, the same happens with the left eye (fig. 1).

Rotations. When the patient looks to the right there is a slight restriction of the adduction of the left eye, but at the same time that eye makes a definite upward movement; the abduction of the right eye is normal (fig. 2A). In levover-

* From the Clinical Division of the Dartmouth Eye Institute, Dartmouth Medical School. The case described was demonstrated at a staff meeting of the Dartmouth Eye Institute.

sion there is a restriction in the adduction of the right eye, more pronounced than on the other side, and also an upward movement of the adducted eye; the abduction of the left eye is normal (fig. 2B). The movements in all other directions are free, except that in looking up and right and up and left the adducted eye makes a much larger excursion upward than does the abducted eye (figs. 2C and 2D). In this case the convergent strabismus is complicated by an *overaction of the inferior oblique muscles* of both eyes, resulting in an excessive upward movement of the adducted eye.

This is not a rare occurrence. In some of the patients the overfunction is so marked that it necessitates a myectomy of the inferior oblique muscle.

This particular case shows very well to what the overaction is *not* due. It is not an *apparent* overaction, simulated by a weakness of the superior rectus muscle

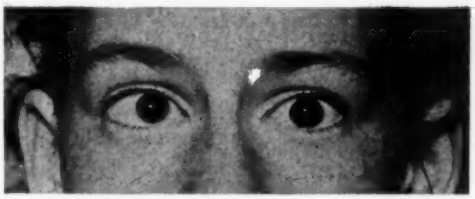

Fig. 1 (Burian). Primary position.

of the abducted eye, since the elevation of the abducted eye is perfectly normal (figs. 2C and 2D). Nor can the overaction of the inferior oblique be the result of a weakness of the superior oblique; the depression of both eyes in adduction is normal, indeed, if anything, somewhat excessive (figs. 2E and 2F). Finally, it cannot be due to the action of a skew insertion of the internal rectus muscle, since both internal rectus muscles are underactive rather than overactive. It is quite clear that this case presents an actual enlargement of the field of fixation of

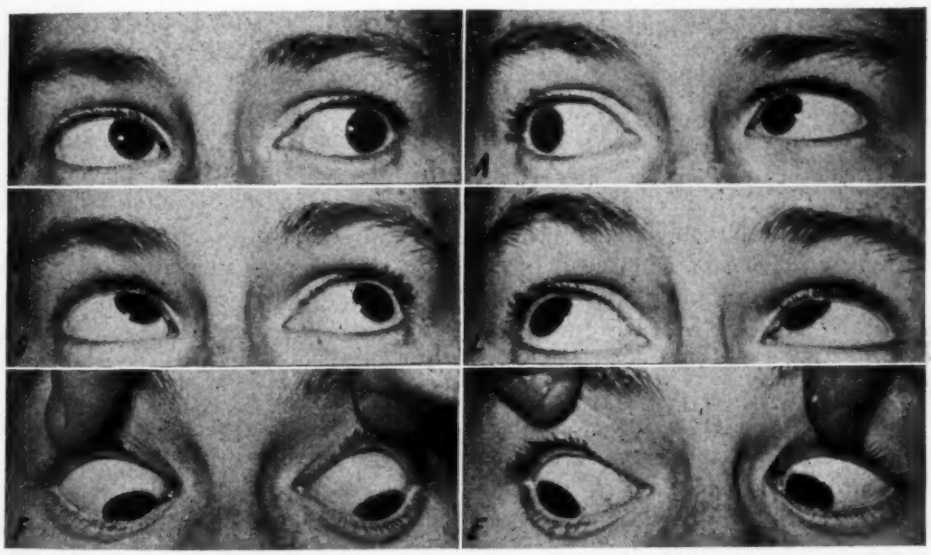

Fig. 2 (Burian). A, *Dextroversion.* Adduction O.S. slightly deficient; marked overaction of the left inferior oblique muscle. B, *Levoversion.* Adduction O.D. deficient; overaction of right inferior oblique muscle. C, *Looking up and right.* Same as A. D, *Looking up and left.* Same as B. Note that there is no deficiency in the action of either superior rectus muscle. E, *Looking down and right.* Excursions normal, except for deficient adduction O.S. F, *Looking down and left.* Excursions normal, except for deficient adduction O.D.

the adducted eye in elevation and adduction; an actual and typical overfunction of the inferior oblique muscles.

Cover test. The patient fixates the light in the center of the tangent scale. The right eye is covered, and after removing the cover a slight outward movement of the right eye is apparent. But this outward movement is somewhat concealed by a slow *downward* movement of the eye. Immediately after uncovering it, the right eye is definitely higher. It stays in this position for a moment and then slowly turns down, possibly even somewhat below the horizontal plane. The left eye

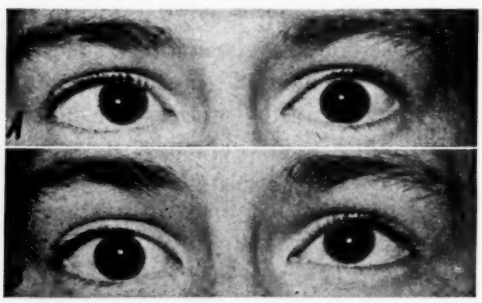

Fig. 3 (Burian). A, Immediately after uncovering the right eye: The right eye is higher than the left. B, Immediately after uncovering the left eye: The left eye is higher than the right.

also shows a slight outward movement and a slow *downward* movement in the cover test. However, it is apparent that the left eye makes a wider sweep downward than does the right eye. When the eyes are alternately covered, the eye which assumes fixation moves slightly out and very noticeably downward. This downward motion is very slow unless the opposite eye is covered, in which case the downward motion is speeded up. In other words, under cover each eye turns in and up; the left eye going farther up than the right eye (fig. 3). Such an elevation of *each eye* under cover must not be confused with a hyperphoria. It is a dissociated movement which Bielschowsky designated as *dissociated vertical divergence.*

In measuring the angle of squint with prisms, the horizontal movement of the eyes is stopped with a prism of 10$^{\Delta}$, base out, but the dissociated vertical movement still persists. This vertical movement cannot be stopped by adding prisms, base down or up, in front of the eyes. It is impossible to determine the amount of the dissociated vertical divergence by means of the cover and prism test. This test cannot be applied to the measurement of the dissociated vertical divergence.

Double-image test. With a dark-red glass in front of the right eye, the patient reports that the red image of the fixation light of the tangent scale is at 5 arc degrees to the right and 6 arc degrees below the center light. With the red glass in front of the left eye she sees the red image 5 arc degrees to the left of the fixation light and 12 arc degrees below it. These at first somewhat baffling results of the double-image test are easily explained by a simple analysis. The uncrossed diplopia indicates that the patient has normal retinal correspondence and that the distance of the double images corresponds to the residue of the convergent strabismus of 5 arc degrees. The vertical diplopia—simulating both a right and left hyperphoria—shows that there is a dissociated vertical divergence. The fact that the vertical distance is larger when the red glass is in front of the left eye indicates that in addition to the dissociated vertical divergence there probably exists in this case a left hyperphoria which happens to be of the same amount as the dissociated vertical divergence; namely, 6 arc degrees.

Examination for binocular vision. On the synoptophore the patient has an objective and subjective angle of squint of about 10$^{\Delta}$ of esotropia with first-degree

targets. The patient is able to fuse second-degree targets and has fusional amplitudes of from 7 to 12Δ of convergence to 3 to 5Δ of divergence. She has third-degree fusion, but there is considerable suppression of the right eye.

In the stereoscope the patient fuses properly and has up to 60 or 70 percent stereopsis with the graduated Keystone DB_6 chart.

It is unusual to find such a high degree of binocular coöperation in a patient whose horizontal strabismus began at a very early age, who had a rather large angle of squint up to the age of eight years, and who has, in addition to the horizontal, a marked and complicated vertical muscular imbalance. It is not surprising that she loses fusion at the slightest provocation.

Summary

This patient has had since birth an *alternating convergent strabismus* with a large angle of squint. In spite of that she has preserved the normal sensorial retinal relationship. The horizontal deviation is complicated by vertical disturbances consisting of three components: An *overaction of both inferior oblique muscles,* a *left hyperphoria,* and a *dissociated vertical divergence.* Notwithstanding the severe handicap, the patient has most of the time binocular vision and a fair amount of stereopsis.

The characteristic features presented by this patient are not always displayed so clearly as they are in her case. But it is mainly through the study of pronounced cases that one learns to improve one's diagnostic ability.

It is of importance for the therapy to make the diagnosis of dissociated vertical divergence. This is best done by using a dark-red filter in conjunction with the tangent screen, and placing the filter always alternately in front of either eye. It will not be discovered if the filter—or the Maddox rod—is placed routinely in front of only one eye, say the right. If a dissociated vertical divergence is mistaken for a right or left hyperphoria, prisms may be given or even an operation performed. The dissociated vertical divergence is, however, a purely innervational anomaly which is not accessible to therapy by prisms or operation.

REFRACTION CLINIC*

Discussion by Albert E. Sloane, M.D.†
Boston

A 24-year-old lady, a bookkeeper, who had never worn glasses complained of blurred near vision after prolonged work. She stated that the print tended to run together and that she could make herself see clearly by either rubbing or closing the eyes with force. She volunteered that it was probably the lighting which was the cause of her difficulty.

Examination

The first examination revealed:

Vision O.D. 20/30. With a +2.00D. sph. ⊂⊃ −.50D. cyl. ax. variable it was 20/20−3 to 20/20. Vision O.S. 20/30. With a +2.00D. sph. ⊂⊃ −.50D. cyl. ax. variable it was 20/30−3 to 20/20.

It was found that one could not be sure of the axis of the cylinder since the subjective test showed a varying choice of axes from time to time. Retinoscopy seemed to indicate with-the-rule astigmatism (−axis 180°) but this was not always acceptable to the patient. Since spasm of accommodation must have been causing the varying findings, homatropine was ordered and examination to be made on another day. The second examination under cycloplegia showed:

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† Director of Department of Refraction.

Vision O.D. +2.75D. sph. ⌯ −.50D. cyl. ax. 150° to 30° = 20/30; O.S. +2.75D. sph. ⌯ −.50D. cyl. ax. 135° to 180° = 20/30.

Even under these conditions one could not be sure of the axis, which varied as much as 60 degrees, when trying to place the cylinder in its proper meridian. It was then decided to check the patient on a morning when she had not used her eyes. The third examination revealed:

O.D. +2.25D. sph. ⌯ −.50D. cyl. ax. variable; O.S. +.25D. sph. ⌯ −.50D. cyl. ax. variable.

You will note that again the proper axis could not be satisfactorily ascertained. The swinging-cylinder test did not agree with the cross-cylinder check nor with itself on repeated trials.

The phoria test was made with a +1.50D. sph. in place and was found to be: distance, 2$^{\Delta}$ esophoria, vertical orthophoria; near, 2$^{\Delta}$ exophoria.

Discussion

A 24-year-old person with symptoms referable to her work is presented. It is the patient's suggestion that poor lighting is the cause of her difficulty. We may limit the discussion to three phases:

(1) The muscle balance of the two eyes. Note that there is only 2$^{\Delta}$ of esophoria present for distance with no vertical imbalance and only 2$^{\Delta}$ of exophoria at near. This certainly lies within normal limits and should be excluded as a cause of the patient's complaints.

(2) The physical environment from a standpoint of lighting. It is true that inadequate illumination can cause asthenopic symptoms, but the complaints are usually those of fatigue and general discomfort rather than of periods in which the vision is clear and then blurs and then can be made clear again by shutting or rubbing the eyes.

(3) The refractive error. Certainly there is enough hypermetropia to produce symptoms at near and yet allow fairly good distance vision, because at this patient's age the accommodation is active. It would readily appear that the hyperopic error alone can well explain the symptoms. A perplexing situation is introduced by the disclosure of a definite amount of astigmatism as found by three refractions and yet an inability properly to establish the position at which this astigmatism should be corrected. While this occurrence is relatively rare it does happen sufficiently often to make its management a problem. It seems that some people cannot discern the best position for a correcting cylinder when there is an associated substantial spherical error that has heretofore been unrecognized. Under such circumstances it is best to ignore the astigmatic correction and prescribe only for the spherical component. Almost inevitably, such a person will be able to give an accurate determination of his astigmatism shortly after he has worn his spherical correction for a time. It is generally true that it is better to correct only the astigmatism that a patient manifests on subjective tests rather than an astigmatic error that is discovered objectively and that the patient persistently rejects subjectively.

Solution

I should order +1.50D. sph. for each eye and ask the patient to return after an interval of not more than one year for a reëxamination and before that if there are symptoms. I should tell the patient that full correction cannot be given at this time and for this reason the earlier-than-usual second visit will be necessary.

Questions

House Officer: Do you not find that with cylinders of even this order (0.50D.) the patient will frequently be unable to

decide the exact axis within 30 degrees?

Dr. Sloane: In errors wherein the spherical component is high, such as over 4.00D., I should expect difficulty in finding the axis within 15 degrees, but in errors wherein the spherical component is 2.00D. or less, the patient can generally pick his axis within 10 degrees. Usually he can pick it almost "on the nose" if he has worn glasses before and his vision is good. Have you never seen a person with an error of +2.00D. cylinder who has never worn glasses before and could not make a choice of axis within an amplitude of 15 degrees yet after having worn his glasses for a month or so, could select his axis exactly? (This makes one feel almost stupid in having failed to get the proper axis at the first visit.)

243 Charles Street.

CAPILLARY HEMANGIOMA OF PALPEBRAL CONJUNCTIVA

Pathologic report

Otis D. Wolfe, Capt. (MC), A.U.S.
Fort Riley, Kansas

Although hemangiomata are considered neoplastic in nature, it is generally conceded that the predisposing condition is present at birth, even if the tumor itself is not.[1] Consequently, they are most often seen in young people and are especially common in the newborn. Hemangiomata of the conjunctiva are rather uncommon in adults, and, when encountered, one often obtains a history of a small "birthmark" which had been present for months or years and then began to grow rather suddenly.

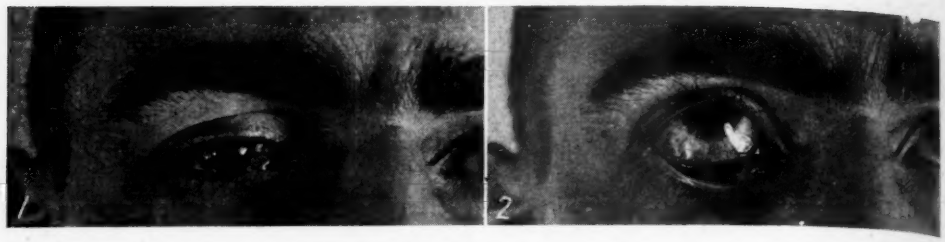
The following case is reported, not because hemangiomata of the conjunctiva are rare, but because, in this case, the history of onset was unusual and misleading. Only pertinent points in the history and examination are included.

The patient was a white male, aged 21 years. He presented himself at the Eye Clinic with the request that a "chalazion" be removed from the lower lid of the right eye. The growth was first noted four months previously at which time there were pain, redness, and swelling of the area. Within a period of not more than two days he noted a small "lump" which could be felt through the skin. The acute symptoms subsided rapidly; however, the localized "lump" persisted but caused him little discomfort.

The growth increased in size gradually over a period of approximately four months, and this resulted in mechanical impairment of vision. Also a mucous discharge was present for the first time.

The past medical and family history was irrelevant. The patient felt certain that there had been no growth nor other abnormality of this lid previous to four months ago. He had had an "ordinary chalazion" on the upper lid of the right eye which had been surgically removed approximately a year ago through a horizontal skin incision. The onset of this older growth was similar to the present one, but following the initial acute stage he was free of symptoms. The growth had been removed for cosmetic reasons. The patient stated that he had had a total of five chalazia but that only the one had been surgically removed. None of these had occupied the site of the present one. He gave no history of trauma to the conjunctiva or lid area.

Examination. A soft, bluish-red, globular mass, which readily changed its shape on manipulation of the eyelid, was observed in the palpebral fissure of the right eye. It rested snugly between the free border of the lower lid and the infero-nasal quadrant of the cornea and bulbar conjunctiva (fig. 1). The surface was covered



Figs. 1 and 2 (Wolfe). Capillary hemangioma of palpebral conjunctiva. Fig. 1, Appearance of tumor with eyes in primary position. Fig. 2, Appearance of tumor when patient looked up and lower lid was everted.

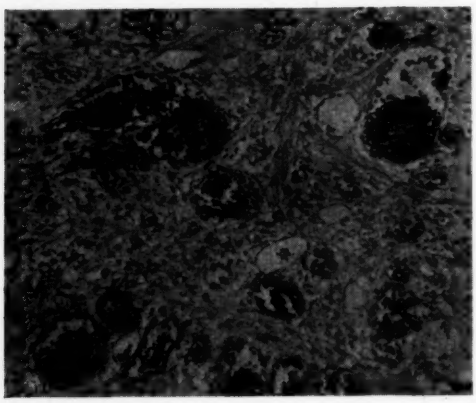


Fig. 3 (Wolfe). Photomicrograph of tumor in section (×100).

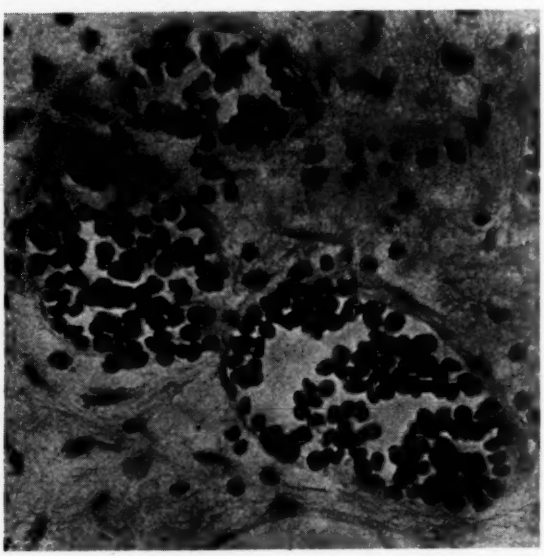


Fig. 4 (Wolfe). Photomicrograph of tumor under high power (×470).

with mucus; there were no ulcerations. When the lower lid was everted the mass was seen to arise from the palpebral conjunctiva midway between the free and attached border of the lid, about 5 mm. temporal to the lower punctum (fig. 2). The mass measured 6 by 5 by 3 mm. and was firmly attached by a short but broad pedicle to the underlying tarsal conjunctiva. Compression of the mass was not attempted. There was no apparent tenderness. The surrounding bulbar and palpebral conjunctivas were injected and the limbal vessels between the 3- and the 7-o'clock positions were moderately engorged. The cornea was clear and did not stain with 22-percent fluorescein.

Treatment. Pontocaine 0.5 percent was instilled locally. The infratrochlear and infraorbital nerves were anesthetized with 2-percent procaine. Procaine was also infiltrated into the lower cul-de-sac adjacent to the tumor. Bleeding was controlled with a chalazion clamp. A vertically elliptical incision was made on either side of the tumor close to its base. After the mass had been excised, the base was gently curetted. No sutures were used. Postoperative bleeding was negligible. The eye was covered with a pad, but the patient was directed to remove the eye-pad when he returned to his barracks.

The patient was reëxamined five days postoperatively. He reported that there had been no untoward reaction during this period. He was last seen approximately six weeks following the excision. At this time he was confined to the hospital with measles, so that a photograph was precluded. The conjunctiva was perfectly smooth and there was no evidence of residua or recurrence.

PATHOLOGIC REPORT (*figs. 3 and 4*). *Gross:* The specimen consists of an injected polypoid, epithelium covered growth 6 by 5 by 3 mm. in size, with a smooth surface. The interior is soft in consistence and of a homogeneous dark-brown color. The whole specimen is used for blocking. *Microscopic:* The section consists principally of loose, fibrous connective tissue that is heavily studded with small, thin-walled blood capillaries, all of which are congested. The fibrous tissue, is young, and numerous fibroblasts are present. Throughout the section there is a dense infiltration by all types of inflammatory cells, principally lymphocytes and monocytes; plasma cells toward the central portion of the section and polymorphonuclears around the periphery. There is no evidence of the presence of rhinosporidia. (Examination for rhinosporidia had been specifically requested.) *Pathologic diagnosis:* Capillary hemangioma of the conjunctival surface of the right lower eyelid with acute inflammation.

REFERENCE

[1] Duke-Elder, W. S. Textbook of ophthalmology. St. Louis, C. V. Mosby Company, 1938, v. 2, p. 1798.

SOCIETY PROCEEDINGS

EDITED BY DONALD J. LYLE

ROYAL SOCIETY OF MEDICINE

SECTION OF OPHTHALMOLOGY

March 12, 1943

MR. FRANK A. JULER, *chairman*

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TUBERCULOSIS OF THE CONJUNCTIVA

MR. S. H. BROWNING (for Mr. Harold Ridley and Mr. Williams) presented a 29-year-old woman who complained of an ulcer on the lower lid which was first noticed in December, 1942. It was a punched-out ulcer, with hard edge, on the inner third of the lower lid of the left eye. There was a yellow patch on the bulbar conjunctiva where the ulcer touched. In the course of about one month the ulcer, as such, healed. The condition was obviously tuberculous.

Sections of a portion of the conjunctiva showed typical tuberculous giant-cell systems and Ziehl-Neelsen's stain showed tubercle bacilli. Guinea-pig inoculation was positive and the tubercle bacilli were found to be of human type.

Discussion. Mr. O. G. Morgan said that he had seen three or four cases of this type in which the infection had been with the human form of tubercle bacillus. They were accidental infections and not part of a general tuberculous condition, and were treated locally with ultraviolet rays; two of the patients were sent to a sanatorium for six months, where they had general treatment and additional therapy with ultraviolet light. All of them had enlarged preauricular glands, which were either aspirated or opened. In two of them he removed all the coxcomb conjunctiva very thoroughly, and he thought that they all recovered. The local condition certainly improved, and, as far as he was aware, there was no spread to a general tuberculous infection. He felt that there was a vast field for sanatorium treatment in these cases. He had also sent to the sanatorium three or four patients who, on account of chronic relapsing bilateral iridocyclitis, had lost one eye and whose other eye was definitely failing. He regarded this condition as tuberculous, although actual tests could not prove it, and he was quite convinced that these patients showed greater improvement in a sanatorium than would have been possible had they been treated as out-patients.

Mr. Lindsey Rea said that he remembered a case of a young girl who had disseminated tuberculous lesions on the eyelids, face, fingers, wrists, and ankles. She was sent to Rollier's Sanatorium at Leysin for two years. There at 5,000 feet above sea level and in brilliant sunshine she greatly improved, and she lived for 19 years afterwards. Rollier gave intensive sunlight treatment to the everted eyelids for 10 minutes every day.

In another case of a boy with a tuberculous eyelid there was a gland beneath the mandible. Excising the gland was considered at the time but the boy was treated only for the eye condition which healed. However, the gland in the neck afterwards broke down, producing a running sinus for years. The patient, shown by Dr. Browning, had inflamed glands which she did not like to have touched. He urged that she be sent to a sanatorium to get as much sunshine as possible.

Mr. P. M. Moffat said that he had a similar case which proved to be tuberculous. The patient was a 14-year-old boy who was sent to Hayling Island for treatment. After six months he returned and was practically normal. Concerning the transmission of the condition from one tuberculous subject to another, he had seen an interesting case seven or eight years ago in which a girl had, what was clinically, a primary chancre of the lip. This subsequently proved to be tuberculous. Her fiancé was found to be suffering from active tuberculosis of the lungs.

Mr. Juler said that he had seen several cases of primary tuberculosis of the conjunctiva which improved under local treatment. In one case a subepithelial roll in the fornix was dissected. Patients with ulceration were scraped and, on the whole, improved. Personally, he was afraid of large doses of tuberculin.

Mr. Harold Ridley said that there was no sign of tuberculosis elsewhere in his patient. The latter was seen by one of his colleagues who suggested that the infection had been caught from farm animals. Whether it was a true case of Parinaud he could not say.

The control of ocular pain

Mr. Charles B. Goulden said that there is considerable difficulty in controlling the pain produced by glaucoma, iritis, and cyclitis. The pain is frequently prolonged and if it is to be controlled by the administration of drugs, requires their frequent administration. The use of morphia is undesirable as it carries the risk of initiating a deplorable habit.

Pain from superficial lesions, such as abrasions of the cornea, can usually be controlled by the use of a local anesthetic and a pad and bandage. The pain of iritis may be reduced by the subconjunctival injection of air, as introduced by Magitot in 1912. The air must be injected liberally by a syringe and a fine needle above, below, and to the right and left so as to cause a large area of emphysema. But the effects of the procedure have a short duration and other means of alleviating pain have to be found.

Two methods are available: *(1) Anesthesia of the sphenopalatine ganglion,* which is produced by the injection of novocaine into the posterior palatine canal with a needle 30 mm. long. The effect of the injection is immediate but the action is not very prolonged. Alcohol is not a safe substitute for novocaine. Blepharospasm and photophobia disappear, the eyes open, and there is no more pain. *(2) Intraorbital injection of alcohol,* which was introduced in 1930 by Weekers of Liége because of its sedative action. There is no difficulty in carrying out the injection, and there is no danger provided that the procedure is carefully done. There is needed a 2-c.c. syringe and a needle 40 mm. long, some 4-percent solution of novocaine, and 40- to 60-percent ethyl alcohol. The needle used must be fine, with a short point that must not be too sharp, so as to avoid injury to the optic nerve or orbital veins. It must be inserted 6 mm. below the middle of the external palpebral ligament, through the skin of the lower lid, the point directed toward the sphenoidal fissure through the muscle cone. It must not be inserted more than 30 mm., so that the point may not reach the sphenoidal fissure which lies 10 mm. deeper. The piston of the syringe should be slightly withdrawn to make certain that a vein has not been pierced. One cubic centimeter of a 4-percent solution of novocaine is injected. This will diffuse around the ciliary ganglion in exactly the same manner as a retrobulbar injection of novocaine. The needle is left in place and, in five minutes, 1.5 c.c. of 40- to 60-percent ethyl alcohol is injected. This does not cause pain and its sedative effect

is almost immediate. One effect of using too deep an injection, which reaches the sphenoidal fissure, is the paralysis of one or more extraocular muscles. The external rectus muscle is most frequently affected. However, the action of the muscle returns completely in about six weeks and the paralysis causes no inconvenience as the affection of the eye, for which the injection is given, is of equal duration. This accident may be avoided by not inserting the needle deeper than 30 mm., and not pushing it too much inward or outward.

Alcohol injections are most valuable in: (1) acute or subacute primary glaucoma; (2) the pain of cyclitis whether associated with hypertension or not; and (3) glaucoma associated with intraocular hemorrhage with blood staining of the cornea. In children with interstitial keratitis it not only relieves the misery of the pain and photophobia but it certainly has a beneficial effect upon the progress of the disease. Since the extreme congestion of the eye is aggravated by the blepharospasm, its relief reduces the redness of the eye and shortens the course of the disease. The injections may be repeated if necessary, but the relief given lasts at least a week and often for several weeks.

Discussion. Mr. O. G. Morgan said that the cases which he himself had treated in this way were cases of blind painful eyes, chiefly as the result of very long-standing glaucoma. The eyes looked perfectly good and one did not want to remove them. He had treated four cases, and the immediate effect of the injections was rather disheartening because it resulted in very great edema, chemosis, much pain, involvement of muscles, and loss of skin sensitivity. He had used absolute alcohol, which was employed by the neurologists for the injection of the Gasserian ganglion. Two of these cases had eventually done perfectly well. A third had improved after a second injection. A fourth case was not successful and the patient refused to have another treatment.

One patient was a woman, aged 46 years, who had had a traumatic cataract needled when she was 23 years old. He first saw her in 1938, when she had bare perception of light with poor projection and poor tension. In 1941, she ran into a post in a blackout, and this resulted in the development of a large vitreous hemorrhage. She had very great pain which continued for about nine months. The question arose as to whether he should remove the eye or try alcohol injections. He first injected novocaine, and then 1.5 c.c. of absolute alcohol as close as he could get to the ciliary ganglion. For the next 48 hours the patient had extreme pain, great chemosis, and swelling over the eyelid. This continued until the third day. In addition there was anesthesia down the side of the nose and in the face. She had almost no movements of the eye. There was paresis of the extraocular muscles, and the only movement that remained was a very slight action of the external rectus. The condition gradually became less acute. Slight up- and downward movement of the eye returned, and the anesthesia of the face completely disappeared. Two months later she returned and stated that she had no pain. Excepting for slightly restricted adduction she had full eye movements. There was no anesthesia in the face and it seemed that there was likelihood of keeping the eye.

A second patient, very similar to the first, also had paresis and anesthesia of the skin. Of the four cases three were ultimately successful. One patient was unimproved and enucleation of the eye was necessary.

Mr. Morgan felt that it was probably unnecessary to use such strong alcohol and that 60-percent solution would be sufficient.

Mr. A. J. B. Goldsmith said that he could recall serious trouble in only one case. The patient was an 84-year-old lady who had an absolute glaucomatous eye. He had used 80-percent alcohol, resulting in edema of the lids and much chemosis. The pain was relieved after the first few days, but recurred and the eye had to be excised. Behind the eye there was a collection of pus; a swab of this was sterile. Probably the strong solution of alcohol had caused a fat necrosis with a secondary sterile abscess formation.

Mr. Lindsay Rea said that in the case of an 84-year-old lady he would use retrobulbar injection of novocaine with a curved needle and remove the eye. However, he thought that in other cases there must be a very great indication for use of alcohol.

Colonel Derrick Vail (MC), A.U.S., said that in the United States a few ophthalmologists had practiced this method since 1930. From his personal experience with this method, it was the only one which worked in a diabetic patient, aged 65 years, with bilateral acute glaucoma and a high degree of vascular hypertension. By means of alcohol injection she was tided over the acute stage of the pain, but before surgery could be undertaken, she had died.

Dr. Edward F. Wilson stated that in cases of hemorrhagic type of glaucoma the operation of cyclodiathermy should be tried. He had performed this operation on one patient, and the relief from tension and pain was immediate.

Mr. George Black said that he thought there might be a place for this method in the treatment of Mooren's ulcer. These were cases in which, in the final stages of the disease, there was much pain, and treatment had to be palliative.

Personally, he was rather dubious about the large-scale use of alcohol in the treatment of painful eye conditions. It must have a destructive effect as an extreme degree of destruction had, in fact, been shown in some cases. In other cases, though the degree of destruction was minor, considerable anatomic disorganization might be caused with possible trophic changes in the cornea or other tissues of the eye. He felt, however, that in suitable cases the treatment, in some way, broke down a vicious circle. These were congested eyes, with brawny edema at the margin of the cornea. A notable consequence of alcohol injection in these cases was the rapidly increasing pallor. It seemed to him that a vicious circle associated with hypervascularity was broken by the injection of the alcohol, and subsidence of the vascularity led to brightening of the cornea and healing.

Mr. R. E. Bickerton said that in the old days the treatment of Mooren's ulcer was by extirpation of the lacrimal sac and was invariably effective.

Colonel Tovell (MC), A.U.S., said that as an anesthetist he had had some experience with the injection of alcohol, more particularly in the injection of the sciatic nerve for the treatment of sciatica. He said that if it was desired to retain motor function not more than 40-percent alcohol should ever be used. He had used pontocaine in the usual concentrations. Pontocaine being 10 times as potent and, therefore, 10 times as toxic as novocaine, one should be absolutely sure that the absorption was not too rapid, otherwise convulsions might occur. The treatment of convulsions was by means of oxygen under intermittent pressure. If the convulsions are of such intensity as to produce spasm of the diaphragm one could not introduce oxygen under pressure. Under the circumstances there should be preliminary treatment with pentothal in order to relax the spasm.

Mr. C. B. Goulden, in closing, said that he had expected the question of possible injury to the optic nerve would be raised. He did not think that such

an accident had been reported. He had been using this method since 1937. He had learned it from Magitot in Paris. Its chief value was in cases of acute glaucoma. It could be done even in the out-patient department before admitting the patient into the ward for surgical procedure. If it was necessary to remove the eye the use of alcohol was of value because the patient, as had been said, was tided over the few days before excision took place, and he was made free of pain at once. It was a most useful method for overcoming pain in interstitial keratitis. It certainly shortened the length of the attack, probably because the blepharospasm was overcome.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

April 5, 1943

Dr. Isadore Givner, *presiding*

The fundus oculi in hypertension and allied diseases

Dr. Martin Cohen discussed this subject during the instructional hour.

Results of the surgical treatment of luetic optic atrophy due to chiasmal arachnoiditis

Dr. Louis Hausman analyzed 23 cases of syphilitic arachnoiditis of the optic chiasm and nerves which were operated on for the freeing of adhesions.

Clinical picture: Progressive loss of vision, primary optic atrophy, and evidence of syphilis. In many of these cases the pupils were Argyll Robertson. In some, there were neurologic signs of tabes dorsalis in the extremities. In others, there were no neurologic manifestations other than those referable to the eyes—certainly no signs of tabes. Most of the patients developed blindness (3/200 to light perception) in one or both eyes in two years or less. As a rule, the onset of visual impairment was gradual, although in three cases it was acute. The visual fields showed various defects: Marked irregular constriction, central scotoma, and sector defects. In only a few cases did the visual fields reveal the characteristic picture of a chiasmal defect. The duration of syphilis before the onset of the visual disturbance was known in 10 cases; it was congenital in one and varied between 7 and 30 years in the remaining.

Laboratory examinations: The cerebrospinal fluid showed an increase in cells in 11, increased protein in 9, and a paretic colloidal gold curve in 2 cases. The roentgen examination of the skull and the air encephalograms threw no new light on the problem.

Treatment before operation: Most of the patients had received either inadequate or no antiluetic chemotherapy before the onset of the visual disturbance. However, after the onset of the visual impairment, most of them had been adequately treated with arsenic and bismuth, and 10 had received fever therapy in addition. Nevertheless, these measures failed to arrest the progressive loss of vision in all cases.

Operation: In the 23 cases reported, the optic chiasm and nerves were explored. The usual frontal approach was used to expose these structures. Weblike or dense adhesions were found around the optic chiasm and nerves in all cases but one; in the latter the arachnoid was unusually tough and adherent. The adhesions and adherent arachnoid were freed by blunt dissection.

Results: The postoperative vision was as follows: In one case visual acuity was restored to 16/15—3 in both eyes, although before operation it was light perception in one and 20/100 in the other; at the end of three years this improvement had been fully retained. In six cases

vision was improved sufficiently to permit the patient to work and get about alone. In three the visual improvement was slight but insufficient to enable the patients to get about by themselves. In two, who had no light perception, there was no improvement. In five the visual loss was not arrested; the result was poor. In three the results were inconclusive. In two there were fatalities, meningitis, and pneumonia with pneumococcus meningitis occurring after the operation.

In summary, Dr. Hausman stated that syphilitic optic atrophy is associated with arachnoiditis, of varying degrees, around the optic chiasm and nerves. Of the 23 operative cases, 10 patients showed improvement in vision, although with adequate antiluetic therapy they had been getting progressively worse up to operation. Of these 10 cases, 5 had been treated unsuccessfully with malaria in addition to salvarsan.

Discussion. Dr. Morris Davidson said that in his special field of activity he rarely sees luetic optic atrophies, but he does see traumatic ones, some of which are chiasmal. As none of these patients were operated on, definite diagnosis of arachnoiditis could not be made. Arachnoiditis is indicated when extraocular signs, such as bifrontal headache, are prominent features. Recently, over a 1½-year period, 10 cases were collected. It is only since 1929 that surgical intervention has shown the reality of arachnoiditis. About 10 percent of the 150 cases published are of traumatic origin. Very few of these traumatic cases go on to blindness.

Since 1934, Dr. Davidson said, he had followed a case of bilateral optic atrophy following head injury. A diagnosis of suprasellar cyst or tumor had been made, but he believed it to be opticochiasmatic arachnoiditis. Operation was refused, and central vision remained 20/20.

Dr. Joseph Igersheimer asked whether the postoperative course differed in those syphilitic patients with and without signs of tabes. He described the case of a patient with long-standing syphilis whose vision rapidly decreased. The only other symptom was headache. There was a binasal inferior quadrantanopsia and a right central scotoma. The neurologic, X-ray, and encephalographic examinations were not helpful diagnostically. Exploratory examination revealed an aneurysm on and medial to the right optic nerve. Two months postoperatively, the left visual field was almost normal and the vision was 20/40; the right eye was practically blind, and the disc atrophic. This case is of interest from the viewpoint of differential diagnosis and because of the binasal quadrantanopsia due to aneurysm.

Dr. Louis Hausman agreed with Dr. Davidson regarding the possibility of nonluetic adhesions about the chiasm. Adhesions were found on operation in several cases explored because of the clinical appearance of tumor. Luetic cases with and without signs of tabes followed the same postoperative course. It is not possible to say definitely how operation results in improvement. With adhesions about the optic nerve and foramina impairing circulation, their removal helps restore the blood supply.

Multiple sclerosis in relation to ophthalmology

Dr. Otto Marburg discussed a series in which changes of the optic nerve occurred in 55 percent of cases. Clinically central scotoma was predominant, paracentral scotomas were frequent, ring scotomas rare. The scotomas started with a passing blindness or obscuration and disappeared completely in 98 percent of the cases. Persisting amaurosis was extremely rare. These scotomas are caused by a so-called retrobulbar neuritis, in

reality a multilocular retrobulbar demyelination with scant signs of inflammation. The sight depends on the integrity of the axons. The pallor of the papilla and the temporal pallor are caused by demyelination, whereas the axons may remain intact. Occasionally the axis cylinders are destroyed, causing permanent visual disturbances. The frequency of this retrobulbar multiple sclerosis among the retrobulbar neuritides is almost 60 to 70 percent. Retrobulbar neuritis after sinusitis is very rare (1 to 3 percent). The differentiation is occasionally possible; enlargement of the blind spot or ring scotomas in sinus neuritis; central scotomas, nystagmus, and the characteristic course in multiple sclerosis.

Papillostasis was occasionally observed (complicating hydrocephalus, circumscribed serous meningitis). Occasionally foci close to the eye produce edema. The stasis in multiple sclerosis is not equal throughout the papilla; spots of atrophy may accompany the stasis. The blood vessels are usually not enlarged despite the presence of hemorrhages.

The disturbances of the nerves of the ocular muscles are also frequent and to a great extent initial. The sixth is most frequently affected, whereas a complete third-nerve involvement has never been seen by Dr. Marburg. Some branches of the third nerve on one or both sides are most frequently involved, and the disproportion between the complaint about diplopia and a scanty evidence of nerve palsy is surprising.

Pupillary changes are frequent, even an Argyll Robertson pupil may be present, and since the Wassermann and the gold sol tests are occasionally positive in multiple sclerosis, the differentiation from syphilis is difficult.

Brickner's oscillopsia is directly related to nystagmus. Its deterioration when walking may be explained by Uhtoff's sign (deterioration of the eye signs in multiple sclerosis by any strain, walking in multiple sclerosis being a strain).

The most characteristic eye manifestations in multiple sclerosis are the sudden onset, the intermittent course, and the evidence that there is a multiple process, often proved by very slight signs in different parts of the body and discovered only by frequent examinations.

Discussion. Dr. Thomas H. Johnson stated that the average ophthalmologist does not see many cases of multiple sclerosis and those are naturally the ones in which first the eyes are involved. The eye manifestations are usually blurred vision due to retrobulbar neuritis and diplopia due to paresis of one or more extraocular muscles. Transitory remissions and recurrences are characteristic of multiple sclerosis. With succeeding recurrences there ensues pallor of the disc, which is temporal at first, but usually some vision is retained, even in the most advanced cases.

Dr. Johnson considers the pathology as being an infiltration in the myelin sheaths of the nerves as well as the higher levels. Impairment of function is due more to toxins than pressure of the plaques on the papillo-macular bundle, which, in general, is more resistant to pressure and more sensitive to toxins. With swelling of the nerve head there may be a question about papilledema, but central vision remains good in papilledema until secondary atrophy appears. In the early stages of a Foster-Kennedy syndrome there may be a central scotoma before the appearance of the optic atrophy (and the papilledema on the opposite side) and the diagnosis is difficult for the ophthalmologist.

Patients may live many years with multiple sclerosis. One case was seen which had been followed for 20 years, the first symptom having been temporary loss of vision.

An incipient myasthenia gravis may be hard to distinguish from an incipient multiple sclerosis associated with ocular-muscle weakness. The increase of symptoms as the day goes on and the Jolly tests for fatigability of the eye muscles help in distinguishing the two conditions. A case which appeared to Dr. Johnson to be a typical neuromyelitis optica was diagnosed multiple sclerosis by an eminent neurologist.

The diagnosis of multiple sclerosis is warranted in the presence of a central or paracentral scotoma, an ocular palsy, or both, and a nystagmus, a Babinski reflex, and absent abdominal reflexes.

Dr. Alfred Kestenbaum said he had seen cases of multiple sclerosis in which the disc was swollen and resembled papilledema. They differ in two respects: sudden severe visual loss with central scotoma, and tenderness of the eye on motion and pressure.

Nystagmus in multiple sclerosis is of three types: 1. An infrequent but pathognomonic pendular form resembling the usual fixation nystagmus but differing in its late onset, often accompanied by a sensation of rotation of the surroundings. 2. An almost pathognomonic symmetrical form in which a jerky nystagmus appears on rotation of the eye a constant distance in any direction from the mid-position. 3. An asymmetrical-gaze nystagmus which is brought out by ocular rotation of different degrees in different directions.

Dr. Marburg said that in cases of multiple sclerosis with ocular signs only, careful examination will usually bring out some previous symptoms, such as a complaint about recurrent rheumatism or fatigue on walking, which points to the correct diagnosis. Myasthenia gravis is recognized by the prostigmine test. The Foster-Kennedy syndrome is distinguished by the accompanying olfactory signs and its characteristic eye signs.

Some experiences with vascular diseases of the eye

Dr. Joseph Igersheimer discussed very different topics; however, all were concerned with vascular processes. He said that in prognosis and treatment of so-called embolism of the central artery more optimism is justified. Of course, many eyes are lost permanently, but others regain function after hope is lost. Examples were given of ophthalmoscopic changes as well as those found in other areas of the body, where spasms relaxed and function was improved or regained even after the obstruction had lasted a year or more.

In the glaucomatous state of venous obstruction a marked iritic hyperemia may cause great pain. Sometimes atropine is indicated and may prevent enucleation.

The pathogenesis of exudation into the retinal tissue was considered. Besides the lesion of the vessel wall the factors of the pressure within the vessel and that surrounding it—that is, the intraocular pressure—are significant. Some observations indicate that hypertensive, albuminuric, and diabetic retinopathy do not occur in glaucomatous eyes, or if already present disappear when glaucoma develops. Other findings are interesting from this viewpoint. For example, there is often a low intraocular pressure in cases of retinopathy or venous obstruction. Or, there is a marked difference between primary venous obstruction with secondary glaucoma and primary glaucoma with secondary venous obstruction. In the former case the usual retinal hemorrhages are absent.

Slides were presented showing exceptional branching of the central retinal artery in the optic nerve and pathology of the small vessels in the nerve.

A case of aneurysm of the internal carotid artery was reported. This was interesting, because: First, although the

aneurysm was located above the medial side of the right intracranial opticus, there was a *binasal* lower-quadrant hemianopia (a very rare occurrence in aneurysms of this region). Second, vision of both eyes was reduced to the perception of fingers at some distance. After exploratory operation, function of the right eye became worse and worse, whereas the left eye recovered entirely. The disc of the right eye showed pallor of the temporal side, that of the left showed no discoloration.

Discussion. Dr. Leo Buerger pointed out that thromboangiitis obliterans may affect blood vessels anywhere in the body. The pathology has been well studied and the lesions may resemble those produced by tuberculosis. Allergy may show a picture similar, pathologically, to Buerger's disease, the etiology of which is unknown. He suggested that ophthalmologists may contribute much to the knowledge of this disease if they study these lesions pathologically, trying to find them in the retinal vessels through ophthalmoscopic evidence.

Dr. Sigmund Agatston had also seen occlusion of the central retinal artery with recovery, and cited a case seen one hour after onset. The vision was 20/20 after six weeks. He believes that in venous thrombosis, in addition to the blocking of the vein there is also a secondary sclerosis of the artery. It is possible that in the cases wherein the intraocular pressure remains low, this is the result of reduced nutrition. High intraocular pressure is found in diabetes with rubeosis of the iris, and it remains high for long periods because of continued hemorrhage. In these cases eserine or pilocarpine is not indicated. When glaucoma is present the compression of the capillaries reduces the tendency to retinal exudation. Dr. Agatston had seen bad cases of glomerulonephritis which exhibited no fundus changes. He had never seen Buerger's disease in the eye, but had seen an embolus in the retinal artery in a patient suffering from this condition who had had a previously normal fundus. Retinal arteriosclerosis should be divided into two groups: the rarely severe, progressive senile sclerosis; and the variety found in hypertension and nephritis, wherein occlusion of the arteries, by spasm, reduces the nutrition of the arterial wall, causing hyaline degeneration and fibrosis.

Dr. Martin Cohen said that he believed the improvement of vision in cases of occlusion might be due to canalization of the embolus. Most instances of chronic glomerulonephritis with hypertension show pathology in the eyegrounds.

Dr. Igersheimer concluded by pointing out that glomerulonephritis with high blood pressure and markedly elevated nonprotein nitrogen generally is associated with a retinopathy. He said that there is no doubt but that a so-called embolus can be recanalized with restoration of circulation. He wished to point out that the return of retinal function, after a long period of disability, shows the viability has not been destroyed during the time of dysfunction.

Leon H. Ehrlich,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

May 17, 1943

DR. LOUIS G. HOFFMAN, *president*

CLINICAL MEETING

(Presented by the Department of Ophthalmology, Northwestern University Medical School)

OLD INTERSTITIAL KERATITIS TREATED WITH BETA RADIATION

DR. HELEN HOLT presented S. J., a 12-year-old white girl, who was first seen in October, 1940. The right eye had been painful and extremely sensitive to light

for two weeks. On examination the cornea was steamy with flocculent infiltrates throughout the cornea. Vision was R.E. perception of light, L.E. 0.8. Blood Wassermann reaction was positive, and the child was placed on antisyphilitic therapy. Within two weeks blood vessels had invaded the corneal stroma of the right eye, and the left eye showed signs of involvement. Despite therapy the course of the disease was severe and prolonged. In December, vision was R.E. 20/65+1. L.E. 20/200. The photophobia was gone and the eyes were fairly white but the corneal changes were extensive. In March, 1943, visual acuity had changed little and it was decided to try beta radiation of the cornea in an attempt to clear some of the central clouding and some of the vessels. Three applications were made at weekly intervals, a 25-percent erythema dose to each quadrant of the eye. After three weeks the vision was R.E. 20/30, L.E. 20/70. There was much subjective improvement. The clouding had diminished in density and extent and many of the vessels had become "ghost" vessels. Further clearing was anticipated.

Prolonged retinal angiospasm with resulting retinal degeneration

Dr. Helen Holt said that D. R., a white woman who had been presented before this Society in December, 1939 (Amer. Jour. Ophth., 1939, v. 22, Nov., p. 1266), was suffering from retinal angiospasm associated with marked spasm of the peripheral vessels. Since that time the retinal spasm persisted in spite of all types of therapy. In July, 1941, in addition to very narrow retinal vessels and waxy-appearing discs, a fine mottling of the retinal pigment was noted in the extreme periphery. This degenerative change progressed toward the discs, and the macular areas became extremely mottled with radiating striae, as though the retina were edematous. The vitreous frequently filled with dustlike opacities and floaters and then cleared. The central scotoma had increased in size and fused with peripheral changes so that the field of vision was greatly reduced. Visual acuity in the right eye was reduced to perception of large objects eccentrically; left eye 20/400 (Lebensohn near chart) and about 2/200. Repeated physical and neurologic examinations revealed no abnormalities. Spinal and blood Wassermann tests had always been negative. The degenerative changes were attributed to the prolonged malnutrition of the retinal tissues, due to retinal angiospasm.

Cataracts associated with target-cell anemia

Dr. Helen Holt presented A. V., a 35-year-old woman of Sicilian parentage, had had anemia since childhood. During the past 10 years she had had muscle spasms but no convulsions. On examination there were no abnormal physical findings except lowered visual acuity. The red blood count was 2,340,000; hemoglobin 69; color index 1.0. Blood calcium level was 8.1 and a little later 6.9. X-ray studies of the bones showed generalized osteoporosis. The patient was placed on calcium therapy. Vision was R.E. 20/65, L.E. 20/40. There were fine granular opacities in radial arrangement in the cortex and clustered at the posterior pole, more marked in the right eye than the left; these showed an increase on each examination. In March, 1943, the vision was R.E. 20/200, L.E. 20/65. The granular opacities at the posterior pole had fused into a hammered metallic-appearing subcapsular film, and elsewhere in the cortex were much more dense. A complete blood study resulted in a diagnosis of erythroblastic anemia (Cooley's) from the finding of target cells, microcytosis, hypochromia, and increased resistance of the red cells to hypotonic solution. The calcium deficien-

cy with the associated lens changes is now attributed to this type of anemia.

Complete color blindness

Dr. Helen Holt presented A. W., a 27-year-old woman, who had had poor vision since childhood, extreme sensitivity to sunlight, and better vision in twilight. She had always been totally color blind and had distinguished differences in colors and shades by variation in the gray intensity. Vision was 2/200, 8-point print at 4 inches, and improvement only to 20/200 with a moderate compound myopic astigmatic correction. An oscillating nystagmus was present. The fundi were normal. Visual fields plotted on the tangent screen showed a symmetrical caecocentral scotoma for the 1-mm. target. Colors could not be identified in the pseudo-isochromatic plates or yarn tests. A brother was similarly affected, but the condition was not present in any other members of the family so far as the patient knew.

Plastic operation of the lids after radiation therapy for basal-cell carcinoma

Dr. Helen Holt presented E. S., a 72-year-old woman, who had been shown before this Society in January, 1941. The outer angle of the eye, part of the temporal region, and one half of the lower lid was destroyed by a basal-cell carcinoma which had recurred four years previously, after having been treated with radium. Following treatment with a total of 1,859r with radium the tumor became inactive. In 1942, a modified Wheeler operation was performed in an attempt to rebuild the lid; a second skin graft was performed a few months later. At this time the carcinoma was inactive. There was still a defect of the outer third of the lid margin with exposure of the conjunctiva, and an additional plastic operation will have to be performed. Vision in this eye remained 20/25, and no lens changes had developed following the use of intensive radiation therapy.

Scientific program

Visual testing in industry with demonstration of the ortho-rater

Dr. Hedwig Kuhn gave this demonstration.

Optic-nerve atrophy in malignant nasopharyngeal tumors

Dr. Martha Rubin Folk presented a paper on this subject which was published in this Journal (April, 1944).

The surgical treatment of the orbital manifestations of hyperthyroidism

Dr. Paul C. Bucy said that the exophthalmos so commonly associated with hyperthyroidism usually subsides with the decline of the other symptoms. Rarely, however, it is noted a few days or weeks after the thyroidectomy that the exophthalmos is growing progressively worse. The bulbs become so prominent that complete closure of the lids becomes impossible. The conjunctiva becomes edematous and then injected. The cornea and conjunctiva become dry, then ulcerated and finally develop infection. If the process has not been arrested before this, a panophthalmitis, with loss of the eye, or meningitis, brain abscess, and death is the usual termination.

The treatment of these cases of malignant exophthalmos is not simple. Plastic operations on the eyelids, sympathectomy, and decompression by means of the Krönlein operation, are usually wholly inadequate.

The first indication is careful cleansing of the eyes and the application of trans-

parent moisture-tight shields to prevent drying of the cornea and conjunctiva, to prevent injection, and to encourage epithelization of ulcerated areas. Next, the orbits should be adequately decompressed so as to permit the lids to close and protect the eyes. This is best accomplished by Naffziger's operation. This procedure was devised by him in the early 1930's, and Dr. Bucy said he performed his first operation of this type a few months after learning of Naffziger's first successful result. A frontal osteoplastic craniotomy is made. The frontal lobe is elevated above the roof of the orbit extradurally. The roof and postero-lateral wall of the orbit are then removed, and, if necessary, the optic foramen can be unroofed. The orbital capsule is then incised widely. Only one side should be operated on at a time. The second operation may be carried out after an interval of a few days to a few weeks, depending on the condition of the patient. Careful toilet of the eyes and the use of moisture-tight shields should be continued after the operation.

The details of the original case and of the most recent cases of this type in which operations had been performed were presented.

Discussion. Dr. Sanford Gifford mentioned a case similar to those described by Dr. Bucy. A neurologic surgeon in another city had refused to perform the Naffziger operation on this patient and, when he came to Chicago, Dr. Cleveland did a bilateral decompression in one sitting, which was well tolerated. The patient had marked chemosis on one side, and, in addition, a condition not mentioned by Dr. Bucy, paralysis of the ocular muscles. The involvement of the cornea is probably due to a paralysis of the superior rectus muscles which prevents the eyes from turning up under the upper lids. In this case it was necessary to perform an intermarginal adhesion on one side. This is the procedure described by Wheeler, in which a small area of the lid margin is denuded in two places, then held together with sutures. It can be done following decompression.

This is a vicious circle—the decompression is done because of the chemosis, and the second operation is necessary to get rid of the chemosis which persists. If the second operation were done as part of the primary procedure it would probably be more satisfactory. Instead of suturing the lids together—the neurologic surgeons always do this and the sutures always come out in two or three days—if an intermarginal adhesion were done and allowed to remain in place for two months the result would be good. One need not worry about conjunctival infection; the chemosis subsides rather rapidly when the eyes are closed.

Dr. Michael Goldenburg recalled a case reported in 1933 before this Society (Amer. Jour. Ophth., 1934). A thyroidectomy had been performed by a competent surgeon several months previously. Because of edema and proptosis, a cervical ganglionectomy was done with some improvement, and repeated without much benefit when the exophthalmos recurred. When the patient was seen at the Illinois Eye and Ear Infirmary, no improvement in the condition followed such procedures as canthotomy, suturing the lids, and so forth, and it was decided to explore the orbits. Under general anesthesia the right orbit was entered through a deep fascia incision. When the deep fascia was retracted the fat rolled out as if under pressure. Tissues were removed for study and a drainage tube was inserted. Drainage was also instituted in the other eye.

Active dehydration by proctoclysis was accomplished by means of 500 c.c. of a 25-percent solution of magnesium sulfate,

later increased to 1,000 c.c., alternating with a 25-percent solution of glucose injected intravenously. Improvement was noted in a few days and at the end of about two weeks the patient was able to close the eyelids. The orbit from which no fat was removed and on which only the decompression was performed seemed to do better than the other. The patient was discharged with 10/200 vision without glasses. He had been seen as recently as two years ago.

In studying the removed tissue it was found that the fat consisted of lobules divided by dense connective tissue. It was considered to be a low-grade infection with round-cell infiltration with many polymorphonuclear cells and red cells.

There is distinct limitation of motion of the eyeball in the orbit when the exophthalmos is permanent, and this may be due to the connective-tissue formation. Cases are cited in the English literature of edema persisting even after enucleation of the eye. This is not edema in the usual sense; it is a more solid edema, even myxedema, although there is a difference of opinion on that. Lahey considers this type of edema a myxedema. If it were ordinary edema it should pass off rapidly, but even the subconjunctival tissue is changed into dense connective tissue. If the eyeball can be replaced by palpation prior to operation, it will return to normal position, but if it cannot be replaced there has been connective-tissue formation which will not improve.

Dr. Peter C. Kronfeld said that Reichling and Marx (in Graefe's Arch., 1940, v. 141, 374) expressed the view that strangulation of the circumcorneal portion of the bulbar conjunctiva by the tight lids is an important factor in the pathogenesis of the corneal complications of malignant exophthalmos. In order to relieve this strangulation the two authors recommended wedge-shaped excisions of the conjunctiva, including the indurated subconjunctival tissue. They report five cases in which that procedure alone was sufficient to make the eyeball recede and to bring the disease to a successful conclusion.

Dr. Bucy's statement that the orbital disease as such may not be so progressive as it seems, but that a vicious circle may be set up in the orbit, deserves to be stressed. It is gratifying to hear that opening the optic canal is not essential for the success of the Naffziger operation. Of the two dangers, loss of the eye through perforation of the cornea or loss of vision by optic atrophy, the former occurs more often than the latter. While the relationship between hyperthyroidism and the orbital changes discussed here is not completely understood, it is definitely not that of cause and effect; in other words, the orbital changes are not the direct effect of the hyperthyroidism. As Moncreiff has remarked, these eye changes may occur after thyroidectomy has been performed when the patient is in a state of myxedema. The orbital changes are probably directly related to a state of partial hyperpituitarism; that is, to the so-called central factor in toxic goiter.

Dr. Paul C. Bucy, in closing, expressed his appreciation of the interesting discussion, particularly the point brought out by Dr. Gifford about limitation of the movement of the bulb, which is one of the characteristics of the disease and which is always present. The description of the pathology given by Dr. Goldenburg, and his original and successful treatment of his case, were also interesting. Dr. Kronfeld's discussion of the relationship or lack of relationship of the pathology to the hyperthyroidism is thought provoking as well as interesting.

Robert Von der Heydt.

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ACADEMY MEETING OF 1944

Chicago was again host to the American Academy of Ophthalmology and Otolaryngology in the second week of October. A large group of physicians and their wives attended. The Palmer House extended every facility to the Academy as it always does. No hotel can take perfect care of as many as attend this convention and there are certain to be some inconveniences connected with the almost simultaneous arrival of 2,000 guests, such as waiting in line for rooms. Then, too, elevator service is occasionally unsatisfactory, but here again the Academy puts an enormous burden on what are normally adequate facilities by having so many courses start and finish at the same time, so that there is no distribution of the demand for elevators. Possibly start and conclusion of courses could be staggered a little, so as to simplify this somewhat. Considering the war time the food and service were good. These, of course, are secondary matters, but the success or failure of a convention often hinges on them. Few will regret the choice of the Palmer House for the next year's gathering. As a matter of fact, it is almost Hobson's choice for there are only a few hotels that

can house the Academy. New York hotels are not interested now, since they are crowded beyond belief with individual transients, and the Pacific Coast is too far away for war-time travel.

All sessions were well attended. The ever-increasing popularity of the motion-picture sections was evidenced by their removal to the Grand Ball Room where they displaced the scientific sections, which succeeded them to the Red Lacquer Room. The motion pictures were excellent. Their use is surely a most satisfactory method of teaching.

The joint session on Monday, at which the question of head pain was considered, was highlighted by Dr. Bayard T. Horton's excellently illustrated presentation of histamine headaches. Their terrible severity, usually unilateral nature, rapid relief by adrenalin, and cure or at least long-lasting relief by histamine desensitization were admirably depicted. At the ophthalmic section, many excellent papers were read. The ever clinically minded were particularly attentive to the Wilmer report by Drs. William F. Hughes, Jr., and William C. Owens on cataract extraction. Best results were obtained when two McLean sutures were used and a round pupil retained after an intracapsular extraction.

Another presentation of great interest was that of Dr. Pischel on the surgery of retinal detachment. His results in uncomplicated cases are almost incredibly good. This was developed in his instruction course, not in the scientific discussion, which was concerned particularly with scleral resection in cases of retinal shortening from scars and the like, and is successful in less than 30 percent of the cases, but well worth trying in otherwise hopeless cases.

Another interesting paper was on choice of operation in eyes with primary glaucoma and cataracts presented by Dr. Jack Guyton. He concluded that if the glaucoma could not be controlled by miotics and was noncongestive, some fistula-producing operation should be done; if, however, the glaucoma could be controlled or if chronic congestive, a combined cataract extraction should be done, which often is all that is necessary. Finally, that making the section through the bleb was as good as making it anterior to it.

Entertainment was somewhat restrained as befitted a war-time program. An informal dinner was substituted for the usual banquet. Excellent talks were made by Lt. Col. James N. Greear, Jr., on "The rehabilitation of the war blinded" and by Dr. Raymond B. Allen on "Post-war medical education," both vital subjects to everyone either directly or indirectly. The beautiful violin solos by Mrs. Anderson Hilding must surely be mentioned as a major factor in the pleasure of the evening.

On the preceding night alumni banquets were followed by beer and dancing in the Grand Ball Room and by floor shows from the Empire Room. This form of entertainment seems as satisfactory as any thus far devised for an early get-together of the members.

An attempt was made to improve the business meeting by introducing the Jackson Memorial Lecture and inviting the neophytes especialy to be present. Dr. William H. Crisp delivered a truly classical paper on the development of refraction with Dr. Jackson's special contribution to it to an appreciative audience of two or three times the usual size; unfortunately, very few of the new members put in an appearance. Apparently this is not the way to attract them. Dr. Crisp's paper will appear in this Journal.

New officers are Dr. Gordon B. New, president; Dr. Alan C. Woods, president-elect; Dr. Edmund B. Spaeth, first vice-president; Dr. William H. Johnston, sec-

ond vice-president; and Major Brittain F. Payne, third vice-president, and Dr. Charles D. Blassingame, member of the Council.

Lawrence T. Post.

BRITISH DISCUSSION OF SOCIALIZED MEDICINE

For some months past the columns of the British Medical Journal, the organ of the British Medical Association, have carried an abundance of discussion of the "White Paper," the document which offered for open debate an outline of the British Government's proposals for a general system of socialized medicine.

The views expressed are many. More frequently they are unfavorable to, or at least severely critical of, the British Government's proposals. But, in leading articles, reports of speeches, and, above all, in that open correspondence which is so striking a feature of British journalism, all shades of opinion are represented.

In the columns of a periodical officially representing the British Medical Association it is refreshing to find a number of letters expressing frank and occasionally rather bitter criticism of that medical organization. The Association, through its Council, while condemning the Government scheme in certain principles and details, has shown a disposition to offer constructive criticism for improvement in the proposals. In this connection it is important to remember that the British Government has announced its firm policy to adopt a general scheme of medical socialization, but issued the White Paper as an avowed basis for free public and professional discussion before the actual introduction of a parliamentary bill.

Very blunt is the attitude of the gentleman who speaks of the "apostasy of the B.M.A.," but a speaker who has leanings in the other direction finds it necessary to suggest that many of the letters "contain much individual prejudice, and are written as though their opinions and statements were self-evident facts."

Dr. H. Guy Dain, Chairman of Council of the B.M.A., speaking before the profession at Bristol, calls attention to the wide contrasts between those physicians who would take no part whatever in a government service, however organized, and those of the other extreme who believe that the best service would be by whole-time salaried officers; and between those who argue that the state service should be for everybody in the country, "irrespective of means, age, sex, or occupation," and those who believe in limitation to a certain income level. Dain points out that private practice is beginning to reappear even in Russia, and that in Norway, notwithstanding a system of state hospitals, voluntary hospitals have entered the field. Whatever arrangement is made, Dain suggests, it must provide for the freedom of the patient to go where he desires for his doctoring and to pay for it if he wishes to do so.

We find one writer stating that the general British public has welcomed the scheme; and another declaring that one hundred percent of his office patients have voted against it.

One correspondent writes at some length to draw a parallel between the attitude taken by the British Medical Association in 1911, when Mr. Lloyd George introduced his National Insurance Bill, and the situation today. It is suggested that the British Medical Association then fought what at first appeared to be a losing battle but in the end worked out not so badly for the profession. This writer quotes a British gibe to the effect that "The National Insurance Act gave the doctors their motor cars." In 1911, while the National Insurance Bill was being fought in Parliament, the British

Medical Association "obtained the signatures of twenty-seven thousand doctors to a pledge that they would not accept service under the Bill except on terms in accordance with the Association's policy, and that they would not enter into any contract except through a local medical committee representative of the local profession." Today, says the same writer, the British profession has the advantage of considering a preliminary scheme instead of fighting a bill already introduced into Parliament.

Surgeon Vice-Admiral Sheldon Dudley, Medical Director-General of the Navy, delivering the Harveian Lecture before the Harveian Society of London, pointed out that the oldest and most comprehensive medical services were those of the Navy and Army. Speaking as to the possible effect of a set salary upon the quality of the physician's work, Admiral Dudley said that in the British Navy there were very few medical officers who did as little work as possible, and he argued that "on the whole, self-respect, the desire to do well in the eyes of the herd, a natural sympathy with sick people, and a praiseworthy desire for promotion would outweigh the alleged stultifying effect of a fixed salary." He suggested the experience of the Navy showed that "a patient-doctor relationship of the best type was possible on a salaried basis of remuneration and without free choice."

British municipal hospitals have come in for a good deal of abuse as contrasted with the voluntary hospitals. Yet the accommodations provided in the voluntary hospitals are far from adequate, as demonstrated by the fact that there is usually a long waiting list of applicants for admission.

One of the most interesting products of the British controversy as to the Government's proposals takes the form of a vote by medical students upon a number of questions submitted to them by the British Medical Students' Association. About one fourth of the total number of students replied. Forty-nine percent of them thought that the quality of the country's medical service would be enhanced by the proposed National Health Service, thirty-six percent thought it would suffer, fourteen percent "did not know." Seventy-two percent thought that complete medical services, including hospital and specialized services, ought to be available to everyone free of charge. Eighty-nine percent approved of the principle of health centers. Fifty-three favored payment by a small basic salary plus capitation fees. Sixty-three percent made a statement that it would not be possible for them to set up in practice without incurring a debt. Fifty-one percent reacted on the whole favorably to the Government's White Paper, forty percent unfavorably, and seven percent "did not know." Incidentally it may be mentioned that of those whose fathers were physicians fifty-two percent reacted unfavorably to the document and only thirty-eight percent were definitely favorable.

From medical students a similar vote would rather likely be obtained in the United States, since those who have not yet attained the position of special privilege associated with established practice are still preoccuped with the problem of buttering their daily bread. A British physician "under forty" suggests that the White Paper offers the young doctor two important advantages which should not be forgotten in discussing the future health services; namely, the opportunity to undertake general practice unburdened by financial considerations, and the existence of many more openings for the doctor who wishes to specialize.

What part does ophthalmology play in this general discussion of the British Government's proposals? Plans for an oph-

thalmic service have brought up the question whether refraction shall be carried on entirely by ophthalmic physicians or shall enlist the coöperation of sight-testing opticians. One writer points out that against seven thousand opticians at present officially recognized as qualified to undertake National Health Insurance work, there are throughout the country only about one thousand ophthalmic medical practitioners, a part of whose time is taken up with other eye work. These figures were the basis of a recent recommendation by the Ophthalmic Group Committtee's draft scheme for a National Eye Service, which suggested that it would be necessary to call in the aid of optician refractionists who would work under the supervision of medically qualified specialists. The suggestion that in a few years time a sufficient number of physicians could be trained to do the refraction work is derided by the correspondent on the ground that "men are not going to take the six years medical course, then specialize in ophthalmology, and spend the rest of their lives doing refractions." The correspondent would establish eye clinics each "staffed by a medical eye specialist, who will have under him two or more optician refractionists," with sometimes the help of a nurse, clerical assistants, and possibly an orthoptist. The ophthalmic specialist would do only "difficult refractions or those requiring a cycloplegic." The writer assumes that in the course of years most sight-testing opticians will either "decide to go over to the dispensing side of the business or be absorbed as refractionists in the eye clinics." Some readers will admire (!) the faith of this correspondent in the ability of the subordinate refractionist to determine which refractions are difficult and which will require the use of a cycloplegic.

If a system of socialized medicine is adopted in the United States, very thorny will be this problem of who shall do refraction in the public clinics or wherever it may be done out of the funds provided under the law. W. H. Crisp.

BOOK NOTICES

I WANTED TO SEE. By Borghild Dahl, with a Foreword by William L. Benedict, M.D. New York, The Macmillan Co., 1944. Price $2.00.

Some two years ago Dartmouth College published a book, "Motivation and visual factors," based upon an intensive study of a large goup of college students. The conclusion of the authors, in brief, is that visual handicaps as such can be considered only in relation to the entire personality, specifically to the motivating drives of the individual. The motivation seems to be the dominant factor in any successful or unsuccessful adjustment to the presence of visual anomalies.

No stronger corroboration of the soundness of this conclusion can be found anywhere than in the personal narrative of Miss Dahl, in her volume, "I wanted to see." Here is a woman who from her earliest childhood was totally blind in one eye, had vision of only 4/60 in the other eye, and yet by sheer will and tenacity of purpose managed to get almost everything she strove for, and she aimed high. She would have done wonderfully if she had managed merely to get through grammar school. But Miss Dahl completed a regular high school course, a full college and university course, with the Bachelor and Master of Arts degrees, became a successful high school teacher, anl later a college professor. She also managed to win a fellowship from the American Scandinavian Foundation, which, acclaiming her as a distinguished student in sociology, sent her for a year's study to Norway. And this is not all. We could go on discoursing on her extracurricular accomplishments; for example, being chosen

to give book reviews for clubs, for the Book Review Guild of America, to talk over the radio, and other like activities.

It is a fascinating narrative, heart warming and inspiring. One is thrilled by the unfolding of the life story of a woman, who, blind for all practical purposes from earliest childhood, refused to be "different" from the normally seeing. Her indomitable will to succeed, aided by whatever skillful medical science could do, conquered everything.

For the eye physician this book has a special message. He is often called upon to advise and pass upon the schooling or career of a youngster with defective eyes. Here the doctor is faced with a grave responsibility. It were well that before recommending limitations on a child's schooling and career the doctor study the child as a personality. His whole life may depend upon the doctor's judgment.

Miss Dahl's case may be unusual, an extreme instance, but it does show most convincingly that a child with a dominating motive to achieve and to learn will go further in life, despite visual defects, than a child who is unambitious and listless, though he possess perfect eyes.

In a sense, the book deals with a "ponderous" subject but the style is light and humorous, tinged with pathos here and there. It is highly recommended to lay and professional readers alike.

Joseph I. Pascal.

LIGHT, VISION AND SEEING. By Matthew Luckiesh, D.Sc., D.E. Clothbound, 323 pages, 16 plates, and 83 text figures. New York, D. Von Nostrand, Inc., 1944. Price not given.

The subtitle of this work is "A simplified presentation of their relationships and their importance in human efficiency and welfare." In this book the author points out in the first chapter the fact that mankind has become enslaved by near vision. Hereditary adaptation has been quite unable to keep pace with the extraordinary rapidity of the change from outdoor seeing to day-long indoor tasks. The author attributes eye defectiveness primarily to this fact and makes the important point that though eyesight specialists have made "enormous strides in eye-care, eye-treatment, and eye surgery. . . . Their primary interest is in vision, not in seeing." He further states that "the eyesight specialist is paid for caring for eyes and for prescribing eyeglasses, rarely is he paid to follow eyes into the world of use and abuse." He believes that far too much time has been spent in repairing visual defects and much too little in prophylaxis. He does not, however, carry this thesis further than to state that it is obviously impossible to induce mankind to revert to outdoor life and offers only the improvement of lighting in its broadest sense as a preventive for the ocular difficulties inherent in our manner of life. He gives statistics indicating the greatly increasing deterioration in vision as life progresses and also cites statistics to show that the vision of outdoor man is much better than that of the indoor man. Obviously the thesis of the book is in the subtitle; that is, the contribution that can be made to adequate seeing by adequate lighting. This is the field in which the author has so ably delved for many years and in the promotion of which he has spent his life and made widest researches.

The book is convincing and easy reading for anyone interested in the subject. It has not the elements which would ever make it a best seller, because, though simplified, it still must be classed in the group of serious literature and could scarcely have great popular consumption. There is a considerable list of references and an adequate index. The illustrations and charts are very well done and serve their purpose excellently.

Lawrence T. Post.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

5

CONJUNCTIVA

Canamares Mareno, S. **Sporothricosis conjunctivitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 222-224.

Four cases are reported of diffuse infiltration of the bulbar conjunctiva without ulceration. Preauricular adenopathy was present in all the cases. The diagnosis was confirmed in two cases by finding of the sporothrix in aspirated pus from the preauricular gland. All cleared up under treatment with potassium iodide.

J. Wesley McKinney.

Curry, J. J., and Lowell, F. C. **Epidemic keratoconjunctivitis.** New England Jour. Med., 1944, v. 231, July 6, pp. 11-13.

A male metal worker, 27 years of age, one week before admission to the hospital, had had chilly sensations followed by fever which subsided by evening and recurred in the morning. At that time he noticed a swelling about his eyes which became quite painful. Lethargy was pronounced and several evanescent zones of erythema scattered over the face and forearm were visible. The lymph nodes in the region of the ears in the cervical and occipital regions and the right axilla were enlarged and tender. Frontal and occipital headaches were intense. The conjunctiva was diffusely injected and photophobia marked. The cornea was normal. The patient stated that he had had a mild respiratory infection that had cleared 14 days before the onset of the present illness. He stated also that he had had foreign bodies in his eyes on several occasions. The patient improved on the fifth day and a few days later left the hospital. The writer says that the diagnosis of the disease is difficult when keratitis is absent (as it is in 47 percent of the cases) and when the disease is sporadic, unless the virus is isolated or a rise and fall in antibody titer is demonstrated. In the present case serologic studies during convalescence showed development of antibody against the virus of epidemic

keratoconjunctivitis. (References, one figure.) M. Lombardo.

Freeman, J. D. J. **A granulation tumor of the conjunctiva.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 277-278.

The patient's complaint was of constant discomfort of the left eye, with a feeling of heaviness in the upper lid. The lid tended to droop and there was watering of the eye. The symptoms dated from 1933 or 1934. Discomfort had gradually become more marked. The right eye had never been affected. Examination showed the conjunctiva over the tarsal plate of the left upper lid to be covered with multiple pinkish granulomatous nodules, glistening and soft in consistency. There was no discharge. Examination of the cornea with the loupe and the slitlamp showed no signs of pannus. The bulbar conjunctiva and the lower fornix appeared healthy. The pre-auricular gland was not enlarged. The right eye was unaffected.

Treatment with copper sulphate, magnesium-sulphate solution, and albucid, as well as injections of old tuberculin, gave no improvement. Tarsectomy gave entire relief and the patient made an uneventful recovery. Microscopic examination showed a typical granulation tumor without any evidence of neoplasm. The possible causes for this condition are considered and discussed. Edna M. Reynolds.

Fried, J. J., and Goldzieher, M. A. **The endocrine treatment of keratoconjunctivitis sicca.** Amer. Jour. Ophth., 1944, v. 27, Sept., pp. 1003-1006. (References.)

Gifford, S. R., and Day, A. A. **Leptotrichosis conjunctivae.** Arch. of Ophth., 1944, v. 31, May, pp. 423-426.

This study includes only those cases in which the leptothrix or a thread mold presumed to be leptothrix was found in section or culture. Observation of leptothrix in sections was first made by Verhoeff in 1913. A special staining technique was necessary, and the organism was found only when a characteristic area of focal necrosis was excised and fixed in Zenker's fluid.

The authors conclude that examination of properly fixed and stained material in sections offers greater likelihood of positive identification of the leptothrix than the use of cultures. The value of cultures in addition to sections, however, should not be minimized, as exact identification of the organism in a greater number of cases is desirable. (References, 1 photomicrograph, 1 table.)

R. W. Danielson.

Heimans, M. **Keratoconjunctivitis control measures for industry.** Industrial Bulletin (New York), v. 22, Aug., p. 328.

The author suggests control measures as follows: educating medical personnel as to characteristics of the disease, proper care of hands and instruments used in examining patients, isolation of cases, education of those affected in how to prevent spread of the disease, and adequate sterilization of goggles. F. M. Crage.

Magnus, J. A. **Unilateral follicular conjunctivitis due to molluscum contagiosum.** Brit. Jour. Ophth., 1944, v. 28, May, pp. 245-248.

After three months of treatment along the usual lines for acute conjunctivitis and superficial keratitis, developing after influenza, several small umbilicated tumors were found on the upper and lower lids, encroaching upon the lid margins. The tumors were removed for biopsy and those at the lid margin were destroyed by

electric cautery. The conjunctivitis cleared up entirely within a month after removal of the tumors. The diagnosis of molluscum contagiosum was confirmed by histologic examination. (5 photomicrographs.)

Edna M. Reynolds.

Marin Amat, M. **Contribution to study of the treatment of vernal conjunctivitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Aug.-Sept., pp. 185-189.

Two cases of vernal conjunctivitis with large tarsal vegetations are reported. One was treated with X-ray and the other was operated upon by the Blascovics procedure. Neither case was permanently benefited.

J. Wesley McKinney.

Mata López, Pedro. **Conjunctivitis produced by the staphylococcus.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, Sept.-Oct., v. 3, pp. 201-209.

Staphylococcus conjunctivitis is much more common than is generally believed. It may be associated with staphylococcal infections elsewhere or may occur as a primary infection. The diagnosis is made by smears and cultures from conjunctiva, together with tests for hypersensitivity to the organism. The most efficacious treatment was found to be local use of sulfonamides. J. Wesley McKinney.

Mata López, Pedro. **Contributions to the study of corneoconjunctival calcareous dystrophy, with case report.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Aug.-Sept., pp. 210-217. (See Section 6, Cornea and sclera.)

Moreu, Angel. **Vasomotor reactions in the pathogenesis and treatment of conjunctivitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 194-200.

In vagotonic individuals the conjunctival reaction to various irritants such as excessive cold, heat, ocular fatigue, and other physical or chemical agents is likely to be more marked and prolonged than the physiologic reaction of normal individuals to equal irritation. The conjunctiva becomes injected, with possibly some lacrimation and mucous secretion and reduction in the lysozyme content of the tears. In time the conjunctiva becomes truly hypertrophied and is fertile soil for growth of bacteria. The problem then is to control the vasomotor reactions of the conjunctiva, thus relieving the incident symptoms and preventing the repeated infections which so often occur. In the vasomotor phase this end is accomplished by administration of "bellafoline" to diminish the preponderance of vagus and "ephetonine" to secure excitation of sympathetic. At the same time conjunctival and nasal instillations of ephedrine and adrenalin are made several times daily. No conjunctival antiseptic should be used. If a true conjunctivitis develops, the usual silver nitrate and antiseptics are used. As soon as the infection is eliminated, zinc sulphate is substituted for its astringent effect until the conjunctiva has returned to its original state.

J. Wesley McKinney.

Pérez Llorca, J., and Jiménez Almenara, J. **Reaction of agglutination to B proteus, and intradermal reaction with an extract of the same organism. Its lack of value in trachoma.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 285-288.

The Weil-Félix reaction was positive in only one of 160 cases of trachoma and in none of fifty controls. The intradermal reaction was negative in twenty trachomatous and twenty nor-

mal individuals. The conclusion is that neither the Weil-Félix nor the intradermal reaction is of value in the diagnosis of trachoma.

J. Wesley McKinney.

Reid, R. D. **Meningococcic conjunctivitis.** Jour. Amer. Med. Assoc., 1944, v. 124, March 11, p. 703.

The author points out that meningococcus carriers are not a rarity and that meningococcic conjunctivitis may be more frequent than commonly thought. In any acute conjunctivitis in which gram-negative diplococci are found, serologic and cultural tests are necessary to distinguish between the gonococcus and the meningococcus, thus avoiding searches for sources of infection if the latter organism is at fault. A case history of meningococcic conjunctivitis in a two-year-old child with complete recovery on sulfathiazole therapy is reported.

Robert N. Shaffer.

Saracibar, J. M. **On the diagnosis of gonococcic conjunctivitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 218-221.

Three cases of purulent conjunctivitis are cited from which a gram-negative diplococcus was isolated. Upon culture two of these cases proved to be of micrococcus-catarrhalis infection and the third a gonococcus infection. The conclusion drawn is that differential cultures should be made in all cases of suspected gonococcic conjunctivitis. J. Wesley McKinney.

6

CORNEA AND SCLERA

Braley, A. E., and Sanders, M. **Treatment of epidemic keratoconjunctivitis.** Jour. Amer. Med. Assoc., 1943, v. 121, March 27, p. 999. (See Section 5, Conjunctiva.)

Calkins, H. E., and Bond, G. C. **Adaptation of virus of epidemic keratoconjunctivitis to development in extra-embryonic fluids of chick embryo.** Proc. Soc. Exper. Biol. and Med., 1944, v. 56, May, p. 46. (See Section 5, Conjunctiva.)

Curry, J. J., and Lowell, F. C. **Epidemic keratoconjunctivitis.** New England Jour. Med., 1944, v. 231, July 6, pp. 11-13. (See Section 5, Conjunctiva.)

Fried, J. J., and Goldzieher, M. A. **The endocrine treatment of keratoconjunctivitis sicca.** Amer. Jour. Ophth., 1944, v. 27, Sept., pp. 1003-1006. (References.)

Heimans, M. **Keratoconjunctivitis control measures for industry.** Industrial Bull. (New York), 1943, v. 22, Aug., p. 328. (See Section 5, Conjunctiva.)

Mata López, Pedro. **Contributions to the study of corneoconjunctival calcareous dystrophy, with case report.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Aug.-Sept., pp. 210-217.

The case reported is one of calcareous degeneration of the cornea and of the tarsal conjunctiva of each eye. Both corneas showed punctate deposits of calcium in the superficial stroma, separated by clear areas. The deposits involved the outer cornea except the extreme periphery. The cornea presented a whitish appearance which was less dense in the center. There were subepithelial islands of calcium deposits on the tarsal conjunctiva. Blood-calcium and phosphorus were within normal limits and no glandular

abnormality could be demonstrated. The author discusses the relationship between the parathyroids and vitamin D and the metabolism of calcium and phosphorus. Despite the normal blood phosphorus and calcium the author gave a diet low in calcium, plus ammonium chloride and dionin locally, with the idea that calcium might be absorbed from the corneoconjunctival lesions. A 30-percent clearing was obtained. Vision improved from perception of large objects at 2 to 3 meters to 1/10 in the right eye, and from ¼ to almost ⅔ in the left eye.

J. Wesley McKinney.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Neogy, B. P. **Tonic pupils and absent tendon reflexes (Adie's syndrome).** Calcutta Med. Jour., 1943, v. 40, July, p. 253.

A 29-year-old woman complained of pain which had continued in the right side of her neck since 1934. The Wassermann reaction was negative. The right eye was normal to light and convergence reaction. The left pupil was widely dilated and it dilated still more while staying for twenty minutes in a dark room. On exposure to light the pupil first contracted slowly then briskly. Maximal convergence took place after one minute, and the pupil took 7½ minutes to regain its normal size. Knee jerks and ankle jerks were absent on both sides. X-ray examination of the skull revealed that the clinoid processes formed almost a roof over the pituitary fossa. Although the latter condition may sometimes be found among normal persons, the author considers it worthy of further investigation. R. Grunfeld.

Oroz Zabaleta, H. **Recurrent allergic uveitis with hypopyon.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 170-175.

A case is reported wherein were recorded repeated attacks of uveitis with hypopyon, associated with arthritis and cutaneous ulcers. All examinations were negative except for a marked allergy to the staphylococcus. Both eyes went on to atrophy of the globe. (References.) J. Wesley McKinney.

Soria. **Our therapeutic management of tuberculous uveitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Aug.-Sept., pp. 176-184.

In the treatment of tuberculous uveitis the author relies principally on tuberculin. The initial dose is one tenth of that which gave the minimal reaction to intradermal injection. Injections are given twice weekly by the subcutaneous route. On reaching a dilution of 1 to 1000, injections are given weekly. The maximum dosage is a dilution to 1 to 100. This dose is continued for several weeks, and after a period of rest another series is given using a different tuberculin to avoid possible anaphylactic reaction. (References.) J. Wesley McKinney.

Stern, H. J. **A Simple method for the early diagnosis of abnormalities of the pupillary reaction.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 275-276. (See Section 1, General methods of diagnosis.)

Woods, A. C., and Guyton, J. S. **Role of sarcoidosis and of brucellosis in uveitis.** Arch. of Ophth., 1944, v. 31, June, pp. 469-480; also Trans. Amer. Acad. Ophth. and Otolaryng., 1944, March-April, p. 248.

Sarcoidosis is a chronic granulomatous disorder of unknown causation.

The disease is relatively benign and is capable of affecting any organ but has a certain predilection for the reticuloendothelial system. The characteristic pathologic lesions of sarcoidosis are tubercle-like masses of epithelioid cells, usually without any surrounding caseation or necrosis. Giant cells are usually present. The presumptive diagnosis of the disease depends upon demonstration of clinical signs, of cutaneous changes, of pulmonary infiltration, of rarefactions of the bones of the hands and feet, of elevation of the globulin in the serum, and of (frequent) anergy to tuberculin.

Absolute and final diagnosis must depend upon demonstration of characteristic lesions in biopsy material, usually a lymph gland. The usual ocular manifestation is a nodular iritis, quite similar to the nodular iritis of tuberculosis. The nodules of sarcoidosis are larger, slightly pinker, and more vascularized than those of tuberculosis. The iritis is characteristically quite painless. While the process may progress to phthisis bulbi, the general tendency is more favorable and the entire process may subside without residua.

Brucellosis in man usually goes through an acute phase, characterized by fever, sweats, malaise, muscular pains, loss of weight, and various more or less vague symptoms affecting any portion of the body. Recovery may follow this phase but more commonly a chronic state of infection lasts for months or years. This is characterized by an intermittent low fever, vague pains, and lassitude. The diagnosis of brucellosis is not easy. During the acute phase the organism may be cultured from the blood. During the chronic phase diagnosis must be made from the symptoms, from a complement fixation reaction, and from tests for cutaneous hypersensitivity. The laboratory tests are not highly satisfactory during the chronic phase. The uveal tract may be involved. Often this involvement takes the form of a recurrent simple iritis, but there may be involvement of the posterior uvea and at times the process is so severe that phthisis bulbi results.

The authors studied 200 patients hospitalized with uveitis, and they have tabulated the etiologic factors. Tuberculosis leads as causative agent, with a percentage of 41.0. Other percentages are as follows: syphilis 14.0; sarcoidosis 7.5; brucellosis 7.5; foci of infection 6.0; rheumatoid arthritis 2.5; gonorrhea 6.5; miscellaneous 4.0; and undetermined 11.0.

The diagnosis was confirmed by biopsy in the 15 patients with sarcoidosis. In 15 patients the uveitis was classified as "probably" due to brucellosis. The diagnosis of chronic brucellosis is often very difficult to confirm. This series of patients consisted only of cases hospitalized, and is thought to show a higher than average incidence of sarcoidosis and brucellosis, as only the severer cases were hospitalized. The authors estimate that the actual incidence of sarcoidosis in patients with uveitis examined in the Wilmer Institute is in the neighborhood of 3 percent, and that the incidence of uveitis from brucellosis is less than 7.5 percent. The pathologic findings in one case each of uveal brucellosis and sarcoidosis are described. (References, 7 figures, 3 tables.) John C. Long.

8

GLAUCOMA AND OCULAR TENSION

Allen, T. D. **The history and development of the iris-inclusion operations.**

Amer. Jour. Ophth., 1944, v. 27, Sept., pp. 964-976. (Bibliography.)

9

CRYSTALLINE LENS

Donahue, H. C. **Bilateral cataract extraction in anterior megalophthalmos.** Amer. Jour. Ophth., 1944, v. 27, Sept., pp. 1014-1019. (2 figures.)

Pike, M. H. **Ocular pathology due to organic compounds.** Jour. Michigan State Med. Soc., 1944, v. 43, July, p. 581.

Cataracts were produced in rabbits by oral administration of naphthalene. The progressive pathologic lens changes have been recorded by means of color photography. Although repeated exposure of rabbits to very high concentrations (4.6 to 4.8 mg.) of paradichlorobenzene vapor produced definite intoxication, leading to tremors and toxic eye-ground changes, no lens changes were observed. Prolonged oral administration of definitely toxic quantities of the drug to rabbits did not produce any lens changes whatever.

Together with the evidence gained from experimental work on animals, the experience of the author and his colleagues leads them to believe that cataracts are not produced by paradichlorobenzene, upon either oral ingestion or inhalation of its vapors, in either man or rabbit.

Theodore M. Shapira.

10

RETINA AND VITREOUS

Allen, W., and Herndon, C. N. **Retinitis pigmentosa and apparently sex-linked idiocy in a single sibship.** Jour. of Heredity, 1944, v. 35, Feb., p. 41.

A man belonging to a family in which retinitis pigmentosa is dominant married a girl in whose family idiocy is inherited as an apparently sex-linked recessive trait. The union resulted in the production of both blind and idiot offspring. Out of 13 pregnancies seven terminated in stillbirths or were followed by death in infancy. Three sons are idiots, and one of these has retinitis pigmentosa. Both parents and the three daughters have normal mentality, and none of the daughters has retinitis pigmentosa. One daughter married and has six normal children, five of them boys.

R. Grunfeld.

Cohen, Martin. **Fundus oculi in urologic diseases associated with systemic hypertension.** Arch. of Ophth., 1944, v. 31, May, pp. 427-431.

The purpose of this paper is to call to the attention of ophthalmologists the lesions in the fundus associated with urologic diseases. Cohen has limited his study to the consideration of three urologic diseases associated with hypertension; namely, pyelonephritis, hydronephrosis, and polycystic kidney.

There is still a question of whether the hypertension or the urologic disease or both are responsible for the fundus lesions. The author does not feel that the two should be regarded as a clinical entity, although they are frequently found together. The prognosis of the urologic disease with hypertension rests chiefly on the condition of the vital organs. The signs in the fundus are often the visible guide to the condition of the cardiovascular-renal system.

Case histories illustrative of pyelonephritis, hydronephrosis, and polycystic kidney, and the fundus picture presented in each, are given in detail.

Bilateral neuroretinopathy, possibly of inflammatory origin, was the condition in the case of pyelonephritis and that of hydronephrosis reported here, while in the case of polycystic kidney the diagnosis was bilateral chorioretinal arteriolosclerosis of noninflammatory origin. The changes in the fundus, as revealed by detailed study of these cases, are indicative of the severity of the underlying hypertensive vascular disease, regardless of the factor or factors responsible for elevation of the arterial tension.

The author feels that a report on the examination of the fundus should accompany the records of cases of urologic disease with persistent hypertension, as it is an additional aid to the diagnosis and prognosis of the disease. Interesting discussions of the article are presented by Fishberg and Elwyn. (References, 4 figures in color.)

R. W. Danielson.

Gifford, S. R. **Evaluation of ocular angiospasm.** Arch. of Ophth., 1944, v. 31, June, pp. 453-460.

Patients with a vasoneurotic diathesis may be subject to various ocular conditions, the result of vasospasms. Such patients usually note undue distress on exposure of the extremities to cold. Their hands become white when elevated and flushed when dependent. On examination, such patients show pale hands and feet, and readings with a skin thermometer show an abnormal difference between the oral temperature and the temperature of the extremities. Such susceptible persons show a marked and abnormal drop in skin temperature after smoking cigarettes.

The author reports the cases of 23 patients in whom peripheral angiospasm is the cause of what has been described as central angiospastic retinitis. Evidence is presented to show that peripheral vascular disease causes a certain proportion of the cases of periphlebitis retinae and recurring hemorrhages in the vitreous encountered in young adults. Extreme attenuation of the retinal arterioles with marked peripheral angiospasm was noted in one patient following cataract operation. Treatment with antispasmodic drugs produced improvement. Patients exhibiting the characteristics of any of these syndromes should be subjected to careful examination of the peripheral circulatory system.

Treatment has been directed toward relieving the vasospasm. Complete abstinence from tobacco and protection against cold are advised. Injections of papaverine, typhoid vaccine, and tissue extracts are used. Combinations of theobromine and phenobarbital are given. The nitrites have not been found as effective as other agents. Neostigmine bromide apparently is valuable. A regimen including plenty of rest and avoidance of fatigue and nervous strain is advised. (One illustration, references.)

John C. Long.

Woisika, P. H. **An evaluation of the dark test.** Annals of Internal Med., 1944, v. 21, July, p. 101.

The author presents tables and graphs of the results of his study. The literature concerning the dark-adaptation test divides into three groups: (a) authors who believe that delayed dark adaptation as measured by existing instruments means deficient vitamin A in the diet, in metabolism, or in the reserves of the body; (b) authors who, using the same apparatus, find no correlation between vitamin A and the recorded ability to satisfy the dark test. (c) authors who, dubious of the posi-

tive correlation between vitamin A and performance on existing photometers, have offered modified apparatus of their own.

The author used 700 ambulatory patients selected at random and averaging 45.5 years; also 80 controls, healthy adults (medical students and others) averaging 26 years. Local ophthalmological conditions were excluded in all the subjects.

Biophotometer readings showed the training factor to be negligible. A higher percentage of controls than of patients had normal dark tests. This could not be ascribed to a superior dietary intake. Normal adaptation occurred in a higher percentage of patients receiving normal qualitatively estimated diets, though no strong association could be established statistically. Sex had no effect upon vision in dim light, whether diets were normal or deficient. Negroes were significantly superior in dark-test performance (but average age of negroes was less than of whites). Patients with hypertension exhibited a significantly higher percentage of poor dark-tests. Increasing age influenced dark adaptometry adversely.

The effects of various factors upon the dark test are discussed. The negative include vitamin A, diet, sex, race, and the training factor. The positive are individual factors of age, mentality, fatigue, heredity, and inherent abilities of the nervous system (oxygen consumption, retinal synapses).

Recommendations are made that further work with the rate and end values of dark adaptation be performed to establish the physiologic basis for the test rather than accepting previous work on the importance of vitamin A. A correction factor for age must be determined and must be applied in future work with adaptometers. In the present state of knowledge of scotopic vision, the terms "night blindness" and "poor dark adaptation" should not be used synonymously as to tests.

Theodore M. Shapira.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Morrison, L. F. **Optic neuritis and the ethmoid sinuses.** Jour. Nervous and Mental Dis., 1944, v. 99, May, p. 786.

The author emphasizes the fact that in the treatment of optic neuritis rhinologic surgical intervention should be undertaken only after exclusion of all other possible sources of infection. The technique for submucous resection and bilateral ethmoidectomy is described. Brief data are presented on 39 patients who had submucous resection and ethmoidectomy; in only nine of these patients was there no definite improvement in the visual signs or symptoms. In none of the sinus operations was any marked pus or gross pathology encountered. It is interesting to note, in view of the represented diagnosis of optic neuritis in these cases, that a good number of them are listed as having disc elevations of 4, 5 and 6 diopters. Benjamin Milder.

Wilkinson, P. B. **Amblyopia due to a vitamin deficiency.** The Lancet, 1944, v. 246, April 22, pp. 528-531.

In Hong Kong during the last half of 1940, 15 patients were carefully studied by the author. Generally speaking, they had bilateral sight failure of several months or less, pupillary sluggishness, concentrically contracted fields with central or paracentral scotoma, and for the most part normal discs. All were on diets unsat-

isfactory in quantity or quality, or both. Deprivation of first-class proteins was considered an important factor in the causation of their ocular symptoms. Practically all of these patients' ocular symptoms were greatly improved or cured in from two to six weeks upon an adequate diet supplemented by riboflavin, nicotinic acid, and other components of the B group. Nicotinic acid in 100-mg. doses daily seemed to be followed by greater visual improvement than riboflavin. These cases suggest that the condition is largely due to disturbance in the second link of the co-enzyme oxidase system, which disturbance is also responsible for pellagra. Why the ocular symptoms are so relatively infequent is no known. Charles A. Bahn.

12

VISUAL TRACTS AND CENTERS

Esteban, Mario. **Hemianopsia of allergic orgin.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 167-169.

A patient previously subject to edema of the eyelids had severe headaches, nausea, and vomiting, followed by impairment of vision. A homonymous hemianopic scotoma and a quadrant defect were found in the visual fields. A skin test made with a suspension of organisms isolated from obviously diseased tonsils gave a strongly positive reaction. Treatment consisted of tonsillectomy and giving an autogenous vaccine prepared from the tonsils. There was no recurrence of the symptoms in three years of observation. (Fields.)

J. Wesley McKinney.

Harrington, D. O. **Wartime ocular neuroses.** Jour. Nervous and Mental Dis., 1944, v. 99, May, p. 622.

This article emphasizes the high percentage of neuroses and other borderline mental conditions encountered in wartime, among civilians as well as those in service. Conversion hysteria generally is centered on an organ or function which the patient knows or believes to be defective. It is therefore commonly focused on the eyes, the characteristic complaint being amaurosis. It is usual to find "tubular" functional visual fields. Restoration to normal can generally be promoted by suggestion.

The author mentions two current, divergent views on malingerers, ocular or otherwise. One view is that they have a constitutional psychopathic inferiority, the other is that these patients are criminal offenders. Ciliary spasm is represented as a cause of "asthenopia" which has in the majority of cases a psychogenic basis. Photophobia, too, is mentioned as a disturbance which is usually part of a symptom complex having an organic basis but frequently psychogenic in origin.

Combat fatigue ("shell shock") does not, as a rule, show ocular manifestations—but there may be temporary visual loss, often recurring in transient episodes. Each of the types of wartime ocular neurosis described in the paper is illustrated with a typical case history. Benjamin Milder.

13

EYEBALL AND ORBIT

Converse, J. M. **Two plastic operations for repair of orbit following severe trauma and extensive comminuted fracture.** Arch. of Ophth., 1944, v. 31, April, pp. 323-325.

War injuries of the middle third of the face may result from motor and

aviation mishaps as well as from bullets or bomb fragments. The author describes the method by which two extensive mutilating wounds of this region were treated.

A man of 23 years was struck by a bomb fragment in the preauricular region. The particle penetrated the orbit and the nasal cavity and emerged through the lateral aspect of the nose on the opposite side. When examined six months later, the remains of the nasal bone and the ascending process of the maxilla were found pushed into the ethmoid sinus. The whole region of the inner canthus of the left eye was widened and the eyeball seemed to be pushed laterally. Under local anesthesia an incision about 5 cm. in length was made, starting laterally and extending to the medial end of the eyebrow. Subperiosteal elevation of the tissues was done and protruding bone was resected until the bony wall appeared to be on the same plane as the os planum farther back. The remains of the lacrimal sac were removed, and the internal palpebral ligament was sutured to the remaining periosteum with a 35-gage stainless-steel wire. The operation resulted in elimination of the unilateral mongoloid appearance.

The second patient was a man of 21 years who had had a comminuted fracture of the left malar bone with depression into the antrum. The left eyeball was lower than the right and the floor of the left orbit 18 mm. lower than the floor of the right. Diplopia was constant, necessitating the wearing of a patch over the left eye. This defect was corrected by subperiosteal insertion of a bone graft into the damaged floor of the orbit, the bone being obtained from the inner table of the ilium. Following the operation, diplopia disappeared except in extreme upward gaze and there was considerable improvement in appearance. Both operations are well illustrated by drawings and photographs. (6 figures, references.) John C. Long.

Edelson, David. **Staphylococcic thrombophlebitis of the cavernous sinus.** Arch. of Ophth., 1944, v. 31, April, pp. 329-330.

A woman aged 20 years picked a pimple on the left side of her forehead. Pain developed that day in her head and left eye. On the following day, the typical signs of cavernous sinus thrombosis were present. The patient was violently ill with a temperature of 105.4°F. Staphylococcus aureus was grown from cultures of the spinal fluid. Sulfathiazole was given by mouth and intravenously and large doses of sulfadiazine were given by mouth. A total of 45,000 units of heparin was given during the first month of hospitalization. The patient received 150.5 gm. of sulfathiazole during a period of five weeks and 498 gm. of sulfadiazine during a period of four months. For eight weeks the temperature fluctuated between 100° and 104°F. During the eleventh week it fell to 99°F., after which time it was essentially normal. Six months after the onset of the illness the right eye was quite normal except for a trace of chemosis at the inner canthus. The left eye was moderately proptosed and the cornea was scarred from exposure. There was ptosis of the lid, the pupil was dilated and fixed to light, the vertically acting recti and the inferior oblique muscle were completely paralyzed. The superior oblique muscle showed a trace of function. The author states that it will be necessary to give heparin a more extensive clinical trial to deter-

mine its value in such cases, but that its use is indicated on theoretical grounds. (3 photographs.)

John C. Long.

Flynn, Richard. **Graves's disease with dissociation of thyreotoxicosis, and ophthalmopathy associated with myasthenia gravis.** Med. Jour. Australia, 1944, v. 1, April 15, pp. 344-346.

Bilateral exophthalmus, right ptosis, and left rectus paralysis, associated with Graves's disease, were increased after partial bilateral thyroidectomy. Following further removal of the thyroid, prostigmin injections, and thyroid medication, the ophthalmic and constitutional symptoms practically disappeared over a period of three years. Chas. A. Bahn.

Kraus, J. **An operation for shrunken socket.** Brit. Jour. Ophth., 1944, v. 28, May, pp. 224-228.

The socket is stretched by means of a cavity dilator which produces a circular force from within outward, without undue pressure on the eyelids. (11 drawings.) Edna M. Reynolds.

Mulvany, J. H. **The exophthalmos of hyperthyroidism.** Amer. Jour. Ophth., 1944, v. 27, June, pp. 589-612; July, pp. 693-712; Aug., pp. 820-832. (28 figures, extensive bibliography.)

Soley, M. H. **Exophthalmos secondary to edema and degenerative changes in orbital tissues.** Jour. Nervous and Mental Dis., 1944, v. 99, May, p. 865.

A series of 37 patients presenting marked degrees of exophthalmos is analyzed from the standpoint of etiology, type of treatment, and indication for orbital decompression (Naffziger). Of the series, 24 with hyperthyroidism had subtotal thyroidectomy. Ten had X-ray therapy. Half of the entire group showed progression of the exophthalmos after treatment of the hyperthyroidism—most of them having postoperative hypothyroidism or frank myxedema. They were not helped by substitution thyroid therapy. For this reason, the chosen procedure in thyrotoxicosis is X-ray therapy, to avoid the complications of myxedema. In large or nodular goiters, operative treatment is still indicated.

Orbital decompression is indicated where there is paresis of the extrinsic muscles, impaired vision, marked chemosis of the conjunctiva or lid edema, or corneal ulceration.

Benjamin Milder.

Soto, M. C. **Typical multiple bilateral coloboma.** Anales Argentinos Oft., 1943, v. 4, July-Aug.-Sept., pp. 106-111.

A six-year-old female showed a bilateral congenital coloboma involving inferiorly the iris, lens, choroid, and optic disc. The author presents an effective academic discussion of the genesis of this type of congenital defect.

Edward Saskin.

14

EYELIDS AND LACRIMAL APPARATUS

Cordes, F. C., and Fritschi, U. **Dickey operation for ptosis.** Arch. of Ophth., 1944, v. 31, June, pp. 461-468; also Trans. Amer. Acad. Ophth. and Otolaryng., 1944, 48th mtg., March-April, p. 266.

The Dickey operation for ptosis makes use of the superior rectus as an elevator of the lid. A strip of fascia lata is inserted beneath the middle third of the superior rectus tendon and the ends of the fascia strip are secured to the anterior surface of the tarsus. In this

way the tarsus is connected to the superior rectus by a hammock of fascia. A detailed, illustrated description of the technique is given.

This operation has been used extensively at the University of California for the past eight years. During this time thirty lids have been operated on in 21 patients, with satisfactory results. The youngest patient of this series was a child 13 months old. Permanent diplopia occurred in only three cases; in two of these it was present only on extreme elevation of the lid, and in the third the diplopia was inconstant. Because of the double attachment on the tarsus, there is no tendency to formation of an inverted V at the lid margin, as is at times observed with the Motais operation. The Dickey operation has been found satisfactory in cases of bilateral complete ptosis, unilateral complete ptosis, and partial ptosis when the action of the superior rectus muscle was normal. (References, 7 illustrations.) John C. Long.

Kirby, D. B. **Vertical shortening deformities of the eyelids.** Surg. Clin. North Amer., 1944, April, pp. 348-369.

The importance, in any plastic procedure, of a thorough knowledge of the surgical anatomy of the lids and surrounding structures is emphasized, as well as the rule never to add a deformity in correcting a deformity. Salient principles in care of eye and lid wounds are stressed. Early plastic procedures are always indicated to protect an exposed cornea. If the eyeball is safe, procedures may be delayed preferably until resolution of the fibroblastic process is complete, since operation prior to this frequently adds more scar.

The principles of lid surgery, including delicacy in handling tissues, use of sutures, and hemostasis, are reviewed. Optimum sites for donor grafts are discussed. Use of skin from intact lids is preferred, next best being from the temple, the cephalo-auricular angle, and last from the thigh. Preparation of an adequate bed following loss of tissue is advised, using transplants of fascia lata, cartilage, or fat.

The technique of lid closure by adhesion is well illustrated. The desirability of removal of the nasolacrimal sac if obstructed and infected is stressed as a precursor to any operative procedure around the eye or lids. The main surgical principles in correction of cicatricial ectropion (upper and lower), ptosis, epicanthus, ankyloblepharon, and entropion, are given, as well as those for correction of colobomata and symblepharon. Use of grafts of buccal mucosa is likewise generally discussed. (Bibliography.)

Owen C. Dickson.

Waldapfel, Richard. **Rhinocanalicular anastomosis.** Arch of Ophth., 1944, v. 31, May, pp. 432-433.

Waldapfel gives an evaluation of the new technique for operations on the tear passages recently reported by Blumenfeld (Amer. Jour. Ophth., 1944, v. 27, p. 1043). Obstruction in the tear passages may be situated in the following places: in the canaliculi, in the upper part of the lacrimal sac, adjacent to the canaliculi, or in the lower part of the sac and in the nasolacrimal duct.

The author feels that the old procedures (West, Toti, Mosher, Halle) are the most satisfactory when the obstruction is at the nasolacrimal duct. However, he adds that he feels Blumenfeld's new technique should definitely be considered when the obstructions occur in the canaliculi or in the upper part of the tear sac near the openings

of the canaliculi. (One reference, 3 figures.)

R. W. Danielson.

Winton, S. S. **Monocular myasthenia gravis.** Jour. Amer. Med. Assoc., 1943, v. 122, Aug. 21, p. 1180.

It is pointed out that occasionally myasthenia gravis may present only ocular symptoms, and that these may sometimes be monocular. A case report is given in which the only sign was monocular ptosis. In such cases a diagnostic intramuscular injection of 1.5 mg. of prostigmine methylsulphate is suggested as a simple and reliable test. This gives subjective and objective improvement within an hour. The author states that symptoms in his case were held in abeyance by a combination of 15 mg. of prostigmine bromide and 0.1 gm. of guanidine hydrochloride taken three times daily with meals. He is unable to state whether or not more widespread involvement would have occurred in the absence of specific therapy.

Robert N. Shaffer.

15

TUMORS

Foster, J. **An encapsulated orbital melanoma.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 293-296.

The patient, aged 65 years, showed 7 mm. of exophthalmos of the right eye, with displacement slightly up and in, paresis of the inferior rectus, mydriasis, and vision of 6/24. Orbital exploration by the transpalpebro-conjunctival route of Félix Lagrange revealed an encapsulated tumor about the size and shape of a date-stone, situated on the outer side of the external rectus. The tumor, although melanotic, was strongly encapsulated. One pathologist considered the tumor malignant, but Parsons considered it nonmalignant and felt that it might have originated as an orbital dermoid. Loewenstein regarded the tumor as nonmalignant, a mixed-cell type displaying both ectodermal and mesodermal features. (2 photomicrographs.) Edna M. Reynolds.

Griffith, A. D., and Sorsby, A. **The genetics of retinoblastoma.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 279-293.

An analysis of the cases of retinoblastoma seen at the Royal Eye Hospital in London over the fifty-year period from 1894 to 1943 is given. The total number of cases, 59, included one family in which the tumor occurred in three successive generations. In this family there were six instances of retinoblastoma, five of them bilateral. The remaining 53 were isolated sporadic cases. Among these 53 cases there were eight which were bilateral. The mode of inheritance is shown to be irregularly dominant, since these tumors occur in children of parents themselves unaffected but having a family history of the affection. It is suggested that hereditary retinoblastoma is a distinct histologic entity different from the sporadic types. (3 charts, 3 tables, bibliography.) Edna M. Reynolds.

Herbst, W. P. **Malignant melanoma of the choroid with extensive metastasis treated by removing secreting tissue of the testicles.** Jour. Amer. Med. Assoc., 1943, v. 122, June 26, p. 597.

A man aged 69 years had a malignant melanoma of the choroid. The eye was removed and the tumor studied microscopically. The cells were spindle-cell subtype B, and large and small epithelioid cells; and the tumor had less than 50 percent of argyrophile

fibers. No extrabulbar extension was demonstrated. Metastases to orbit, liver, and the entire surface of the body appeared, and by the end of the third year the patient was practically moribund. At that time the entire left testicle and the secreting tissue of the right testicle were removed. Subsequently there was no further nausea; food was retained; there was no more fluid coming from the respiratory tract; there was definite regression of some of the metastastic lesions, and no new ones developed. The patients died suddenly two months later. The author states the case is not presented with any idea of claiming to comprehend the chemical mechanism involved, but simply as an interesting clinical observation.

Robert N. Shaffer.

Póvoa, Hélion, and Paulo, Jr. **Diagnosis of ocular neoplasms by Botelho's reaction in the aqueous humor.** Rev. Brasileira de Oft., 1944, v. 2, June, pp. 193-201.

This is a reprint of an article which appeared in August, 1931, in the Revue Sud-Américaine. The article, which was in French, is reproduced in memory of the late Prof. Hélion Póvoa.

Roberts, W. L., and Wheeler, J. R. **Report of a case of a primary carcinoma of the lacrimal sac.** Brit. Jour. Ophth., 1944, v. 28, May, pp. 233-236.

A summary of the cases of primary tumor of the lacrimal sac reported to date is given. The patient was a 49-year-old white male. A dacryocystectomy was done with complete removal of the tumor mass, which had invaded the lacrimal bone. Surgery was followed by the use of radium. (2 illustrations, references.)

Edna M. Reynolds.

16
INJURIES

Appelbaum, Alfred. **The simplest instrument for the removal of foreign bodies in the cornea.** The Military Surgeon, 1943, v. 93, Dec., p. 479. (See Amer. Jour. Ophth., 1943, v. 26, Dec., p. 1352.)

Eccles, J. O., and Flynn, A. J. **Experimental photoretinitis.** Med. Jour. Australia, 1944, v. 1, April 15, pp. 339-342.

Lookouts for airplanes, and also eclipse observers, occasionally develop photoretinitis. This condition, first described by Galen, is caused by heat and not by ultraviolet radiation. The amount of heat and the time necessary to produce retinal lesions were studied in anesthetized rabbits. These were given four exposures to the midsummer midday sun in such a way that its images would lie at the four corners of a square. There resulted a lesion 0.14 mm. in diameter which could not be verified without magnification. By magnifying the sun's image ten times, 1.4-mm. image was obtained, which produced definite retinal lesions. The eyes were examined ophthalmoscopically daily for three to six days until the rabbits were sacrificed. With a 2-mm. pupil and exposure to 70 calories per sq. cm., severe lesions resulted in two minutes, less severe lesions in 30 seconds, and no lesions were observed after 3-seconds exposure. On exposure to direct sunlight, the human pupil contracts to from 1.6 to 2 mm. The retinal image of the sun would thus represent 100 calories per sq. cm. per minute. No detectable lesion would be produced by 30 seconds irradiation. Momentary glances across the sun will not produce retinal lesions. If longer

observation is necessary, glasses with high absorption powers both for visible and infrared radiation must be used. Charles A. Bahn.

Clark, C. P. **Industrial and domestic injuries of the eye.** Jour. Amer. Med. Assoc., 1944, v. 124, Jan. 15, p. 157.

The author mentions various ocular injuries occurring in home and factory. He states that a well-trained nurse or physician should care for all but the most trivial injuries, to reduce complications and shorten convalescence. He briefly describes the accepted principles of treating the various injuries, stressing that particular care should be taken to avoid sympathetic ophthalmia. Robert N. Shaffer.

Clements, A. F. **Eye trauma in amphibious troop operations of the U.S.S. Solace.** Jour. Indiana State Med. Assoc., 1944., v. 37, Aug., p. 404.

In the group under study aboard this U.S. Navy hospital ship, 984 patients were seen with various battle injuries and of this number 48 received ocular trauma. Considering the type of resistance met, with mortar shells, hand grenades, and rifle bullets, and in view of the fact that 120 patients in this group had facial wounds, the percentage of eye injuries is low.

Of the 48 patients with eye injuries some had extraocular foreign bodies in one eye and intraocular or penetrating in the other. Only four patients were seen with bilateral penetrating intraocular trauma sufficient to cause permanent total blindness. Twenty-three eye injuries were nonpenetrating and 33 penetrated the eyeball. The fighting man must see at what he is shooting and also when he is being attacked. This obviously must expose the eyes.

Foreign bodies seen were brass, coral, cast iron, or lead, some nonmagnetic and so presenting a difficult problem in their removal. Usual prompt healing followed removal of small metallic foreign bodies. Coral foreign bodies are not easily removed from the cornea or sclera. Their dislodgment involves added trauma and healing is much slower. Delay of 24 to 48 hours, which facilitates removal of metal, cinders, and sand, fails to aid with coral. The coral is apparently fairly well tolerated by the cornea, although subjectively as painful as any other foreign body. Since average stay at the hospital ship was only seven days, final healing results can not be reported. Theodore M. Shapira.

Harkness, G. F. **Industrial ophthalmology and otolaryngology.** Illinois Med. Jour., 1944, v. 85, March, p. 124. (See Section 18, Hygiene, sociology, education, and history.) (See Amer. Jour. Ophth., 1944, v. 27, March, p. 335.)

Johnson, M. R. **Depressed fracture of the orbital rim.** Surg. Clin. North America, 1944, v. 24, April, pp. 340-347.

Fractures of the malar bone with depression of the floor of the orbit should be treated early if cosmetic damage and operative procedures are to be avoided. If the malar bone is not comminuted simple replacement by means of pressure with a blunt elevator intraorally or by attachment of a screw to the bone through a small skin incision is effective. If comminuted, the fragment will usually not remain in position without some form of fixation. The common methods consist of packing the antrum with iodoform gauze and later removal either through a Caldwell-Luc incision or an antrum

window, after fibrous union has occurred.

The author reports a modification of this procedure in a case of comminuted fracture of the left superior maxilla. Ten days after injury, on subsidence of ecchymosis and edema and improvement of the patient's general physical condition, depression of the orbital floor became quite apparent and allowed a vertical muscle imbalance of 5 prism-diopters. Replacement of the depressed fragment was easily possible through either the Caldwell-Luc approach or the antral window made intranasally, but unless supported the fragment would not retain its position.

The end of a rubber glove finger tied at the tip of a catheter was inserted into the antrum and the catheter led out of the nostril through the antral window. Filling of this "balloon" with 20 c.c. of water maintained the fragment without complication. Upon removal of the balloon three weeks later the functional and cosmetic result was good. One diopter of hypophoria for near only remained.

Owen C. Dickson.

Kinsey, V. E., Cogan, D. G., and Drinker, P. **Measuring eye flash from arc welding.** Jour. Amer. Med. Assoc., 1943, v. 123, Oct. 16, p. 403.

The authors have investigated the dosage of radiation from electric welding arcs necessary to produce symptoms. It was found that the ultraviolet production fairly closely paralleled the production of visible light. For convenience a Weston light-meter calibrated in foot candles was used to measure dosage in terms of foot-candle minutes. After preliminary animal experiments 12 young men were irradiated. It was found that an exposure coefficient of 200 foot-candle minutes was required to produce minimal ocular damage consistently in man. In actual practice this represented a 30-second exposure at a distance of 7 feet with the welding machine used in the testing. As to time and intensity of radiation, a minimum standard of safety for men in the neighborhood of electric welding arcs has been recommended as one tenth that required to produce minimal ocular effects. It is stressed that ultraviolet dosage is additive within a 24-hour period, and that, since the time of exposure necessary to produce symptoms is not consistent with the general idea of "flash" exposures, this term must be considered a misnomer.

Robert N. Shaffer.

Linhart, W. O. **Emphysema of the orbit.** Jour. Amer. Med. Assoc., 1943, v. 123, Sept. 11, p. 89.

Following trauma to the orbital region, orbitopalpebral emphysema occasionally occurs. This is due to fracture of the nasal orbital wall, following which air is forced into the subcutaneous tissue by blowing the nose. The author reports seven cases of such emphysema, with X-ray stereoscopic studies which failed to show definite fracture lines into the nasal cavity. However such fractures were assumed to be missed because of the difficulty of demonstration of fractures by X ray of the medial orbital wall. All patients recovered uneventfully in ten days.

Robert N. Shaffer.

O'Hea-Cussen, V. **Removal of a non-magnetic foreign body from the vitreous.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 296-298.

The following technique was used. Immediately over the estimated position of the foreign body two catgut

sutures, 2 mm. apart, were placed in the superficial layers of the sclera. With a cataract knife, an incision one-fourth inch long was made in the sclera between the sutures. This was deepened until the choroid was exposed. While the operator held one suture and the assistant the other, gentle vertical traction was made. Next, the choroid and retina were incised along the full length of the scleral incision. The foreign body was removed with a narrow curette and the scleral sutures were tied and the conjunctival flap replaced. The loss of vitreous was small, not more than two or three drops. Examination of the foreign body showed it to be a piece of stone, an exact 2-mm. cube except that the fifth and sixth sides were slightly longer and tapered to a point. After six weeks hospitalization, the vision was 6/24, improved with a lens to 6/18. The scleral sutures appeared to reduce vitreous loss. Edna M. Reynolds.

Rieke, F. E. **"Arc flash" conjunctivitis.** Jour. Amer. Med. Assoc., 1943, v. 122, July 10, p. 734.

The author discusses actinic conjunctivitis or "arc flash" as he has seen it among the 57,000 workers in the Oregon Shipbuilding Corporation and the Kaiser Company in Portland. Treatment for this condition made up over 30 percent of all dispensary treatments, which have totaled over 500,000 in 21 months. An average of two to four working days was lost per case.

It is rare for the first brilliant contact spark of the welder to produce the condition, though this is the common misconception of both the workmen and many doctors. Rather it is usually caused by ultraviolet bombardment over a period of time varying from a few minutes to a few hours. There is typically delayed onset of symptoms, self-limited course of 24 hours, pronounced bulbar hyperemia, swelling of the lids, slight sunburn of the face, absence of discharge other than tears, extreme photophobia, and feeling of sand in the eyes. Treatment is given for relief of symptoms through dark glasses, cold applications, and the use of a local anesthetic, together with vasoconstricting, mydriatic, lubricating, and sedative preparations. Prophylaxis is accomplished by means of protective shields and lenses, and by explanation to the workers of the hazards involved and of the methods for avoiding them. Robert N. Shaffer.

17

SYSTEMIC DISEASES AND PARASITES

Allen, W., and Herndon, C. N. **Retinitis pigmentosa and apparently sex-linked idiocy in a single sibship.** Jour. of Heredity, 1944, v. 35, Feb., p. 41. (See Section 10, Retina and vitreous.)

Eagan, E. F., and Halpern, H. J. **Iritis, retinal hemorrhage, and changes in the lens following injection of typhus vaccine.** Arch. of Ophth., 1944, v. 31, April, pp. 336-337.

A white soldier aged 22 years developed redness and pain of the right eye 36 hours after injection of 1 c.c. of typhus vaccine. Within a week there was no light perception, the pupil was dilated, and there were posterior synechiae and small deposits of iris pigment on the anterior surface of the lens. The vitreous was cloudy and the fundus was seen indistinctly. There was a large, whitish patch resembling exudate over the disc and macular area. Later, early opacities of the lens were observed. No systemic cause for

the disorder could be found. The left eye remained normal. After three weeks there was no improvement in the condition and the patient was discharged from the army. (References.)

John C. Long.

Frouchtman, R. **Report of study of allergic etiopathogenesis in some ocular affections.** Arch. de la Soc. Oft. Hisp.-Amer., 1943, v. 3, Sept.-Oct., pp. 157-166.

The considerations here presented are based on a study of 30 cases of ocular allergy. Of these cases, 16 were of conjunctivitis, 6 blepharoconjunctivitis, 4 blepharitis, 2 keratitis, and 2 keratoconjunctivitis. Given an allergic individual who has developed certain specific sensitivities, there are three factors which may precipitate and maintain allergic reactions, viz. hepatobiliary affections, focal infections, and various physical agents. It is thought that diminished flow of bile as a result of poor liver function or gall-bladder affection may condition a sensitivity to incompletely digested or absorbed intestinal contents. The therapeutic indication in this case is reduced to a hepatic dietary régime plus measures to stimulate the flow of bile. In 13 patients, the hepatobiliary intestinal factor was important, the role of focal infection not so definite. The removal of obvious foci of infection, although followed at times by more or less marked improvement, was all too often without influence on the allergic reaction. Various physical agents such as heat, cold, and sunlight may activate a reaction in an individual whose allergy might otherwise be in a state of equilibrium. The same may be true of changes in atmospheric conditions, emotions, or menstruation. Finally an individual may become sensitive to the products of the normal bacterial flora of the conjunctiva and skin of the lids, which with the above-mentioned contributing factors determine a progressive hypersensitivity, weakening of tissue resistance, and increasing bacterial virulence. (References.)

J. Wesley McKinney.

Linehart, W. O. **Conjunctivitis and keratitis of allergic origin.** Arch. of Ophth., 1944, v. 31, May, pp. 403-407.

Allergic tests were made on a series of 37 patients with acute or chronic conjunctivitis and 17 patients with keratitis. Allergic desensitization produced improvement in all but six, each of whom was sensitive to various substances. (References, 2 tables and 1 figure.) R. W. Danielson.

Sherman, H., and Baron, B. **Studies in hypersensitiveness of the mucous membrane. 5. Comparative studies of skin and ophthalmic reactions in hay fever patients. . . .** Jour. of Allergy, 1944, v. 15, May, p. 163.

Forty treated hay-fever patients who had at one time shown constitutional symptoms such as nasal or bronchial-mucosa signs, urticaria, or pruritus were studied to determine if an abnormal degree of reactivity existed in either the cutaneous or the mucosal shock tissues.

Normally skin is found to react to allergen dilutions ten to one hundred times weaker than those required for conjunctival reaction. Comparison of cutaneous with mucosal sensitivity, using the conjunctival sacs, revealed that in 50 percent of the forty cases there was an alteration of the skin-mucosa sensitivity ratio. This indicates that in constitutionally reacting patients there is either a reduced skin reactivity or an increased conjunctival

sensitivity. The latter is suspected.

Duration of treatment and nature of constitutional reaction were not factors. Only 17 percent of a control group without constitutional reactions showed similar reduction in the skin-mucosa ratio. Criteria for classification of the severity of conjunctival reactions are given. Owen C. Dickson.

Stewart, F. H. **Dengue; analysis of the clinical syndrome at a South Pacific advance base.** U. S. Naval Med. Bull., 1944, v. 42, June, pp. 1233-1240.

The ophthalmic symptoms mentioned include bilateral supraorbital headaches and palpebral edema. Conjunctival injection, photophobia, and lacrimation are usually slight. Association of ocular tenderness and pain with ocular movement is frequent.

Charles A. Bahn.

Weiss, Charles. **Laboratory aids in the diagnosis of infections of the eye prevalent in tropical and subtropical countries.** Amer. Jour. Clin. Path., 1944, v. 14, April, pp. 200/213. (See Section 1, General methods of diagnosis.

Wilkinson, P. B. **Amblyopia due to a vitamin deficiency.** The Lancet, 1944, v. 246, April 22, pp. 528-531. (See Section 11, Optic nerve and toxic amblyopias.)

Woods, A. C. and Burky, E. L. **Experimental studies of ocular tuberculosis. 8. A study of the increased resistance to reinoculation after recovery from ocular tuberculosis shown by the immune-allergic rabbit.** Arch. of Ophth., 1944, v. 31, May, pp. 413-422.

An experimental study of the increased resistance manifested by the eyes of rabbits which had recently recovered from an attack of ocular tuberculosis revealed that this increased resistance was transitory, gradually diminishing after four months and completely absent after one year.

In this experiment, two groups of immune-allergic rabbits were prepared. The first group, A, was composed of immune-allergic rabbits which had recovered from an attack of ocular tuberculosis in one eye. These eyes were scarred and vascularized but the disease had been clinically inactive for an average period of six weeks. The second group, B, consisted of immune-allergic rabbits with nontuberculous vascularization of one eye. The control group, C, was made up of immune-allergic rabbits which had received no previous ocular injections. As additional controls, normal rabbits were inoculated in the eyes. The eight subgroups were inoculated at two-week intervals for a period of 16 weeks. The eyes of all rabbits were examined clinically each week.

Briefly the results were as follows: A more severe reaction was noted in the more highly vascularized eyes of the rabbits in group B than in the eyes of the rabbits of group A. It would appear that vascularization in itself was not responsible for the relative resistance to reinoculation shown by the rabbits in group A. In the previously normal left eyes there developed the usual ocular tuberculosis exhibited by other immune-allergic rabbits when similarly inoculated. The one positive result in these experiments is the observation that the resistance to reinoculation manifested by recently recovered eyes is a transitory phenomenon. The authors conclude that the resistance shown is related to the persistence of active, but subclinical, tuberculous disease. If this concept of

the process is applied to ocular tuberculosis in man, the obvious lesson to be learned is that the apparent healing of a tuberculous lesion, with subsidence of clinical evidences of activity, should not be regarded with too much complacency. The eye has passed only into the first phase of the healing process, with transitory resistance to reinoculation, dependent probably on premobilization of macrophages. (References, 7 figures, 2 tables.)

R. W. Danielson.

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HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bigelow, M. H. **Recent developments in the prevention of blindness program.** Sight-Saving Review, 1943, v. 13, Fall-Winter, p. 187.

In addition to the usual program for education, community aid, and improvement of hygiene in home, school, and industry which the Society for the Prevention of Blindness routinely follows, certain problems have been stressed during the past year. The society has distributed educational material covering the early symptoms of glaucoma and suggesting the need for proper care. In the field of industrial eye safety emphasis is being placed on the use of eye examinations to increase efficiency, and also on the establishment of adequate standards of eye function for various industrial purposes. Safety programs and courses on eye hygiene have been planned for presentation to industrial and educational groups. Owen C. Dickson.

Gradle, H. S. **A visual service for small manufacturing plants.** Jour. Amer. Med. Assoc., 1944, v. 125, May 27, p. 253.

Because small industrial plants seldom have an efficient medical and safety department, the Illinois Society of the Prevention of Blindness set up a service to try to aid these smaller plants in the elimination of visual hazards. The society carries part of the expense and the management contributes. The service is briefly as follows: (1) After the management has accepted the service a tester conducts a visual survey of each employee. (2) A safety engineer surveys the plant for industrial hazards. (3) A medical analysis of the report of the vision tester is made out for each employee, with specific suggestions for needed corrections. Suggestions for correction of plant defects are made by the industrial engineer. (4) A safety campaign by posters, pamphlets, and so on, is used to stimulate coöperation on the part of the employees.

Robert N. Shaffer.

Greear, J. N., Jr. **Rehabilitation of war-blinded soldiers.** Outlook for the Blind, 1944, v. 38, May, p. 121.

Rehabilitation of the newly blinded soldier is started at the Valley Forge Hospital as soon as it has been ascertained that the loss of vision is permanent. The program of rehabilitation is divided into three periods. The aim in the primary period is that the soldier shall make a satisfactory psychologic adjustment to his loss of vision. He is guided in learning to arrange and take care of his personal effects and of himself. Early stress is laid on motivation indoors as well as outdoors with the aid of a cane. During the intermediate period the pupil receives instruction in Braille, typing, workshop training. To thwart any tendency toward poor speech patterns, discussions are cultivated and social activities encouraged. In the advanced period the

soldier is given higher educational training for a specialized vocation.

R. Grunfeld.

Griffis, Enid. **When the blind soldier goes home.** Outlook for the Blind, 1944, v. 38, March, p. 74.

The blinded soldier is well taken care of as long as he is hospitalized. In the Valley Forge General Hospital at Phoenixville, Pa., and in the Letterman General Hospital at San Francisco, everything is done to nurse him back to health. Under the sympathetic direction of trained workers he learns how to feed, dress, and care for himself, to get about alone in familiar surroundings, and to read and write Braille. A problem arises when the soldier goes home and tries to adjust himself to a new life in the community. At this point the social worker can help. He should make every endeavor to bring the sightless soldier immediately into contact with the nearest Veterans' Administration Facility, where rehabilitation and vocational training are centered. It should be, furthermore, the social worker's duty to guard against outbursts of emotionalism. Misguided and uninformed individuals may endeavor to raise funds and form new organizations designed to aid the war-blind. The social worker should at once point out to those responsible that such movements are not only unnecessary but undesirable, since they serve only to confuse and diffuse the total effort in behalf of the sightless.

R. Grunfeld.

Harkness, G. F. **Industrial ophthalmology and otolaryngology.** Illinois Med. Jour., 1944, v. 85, March, p. 124. (See Amer. Jour. Ophth., 1944, v. 27, March, p. 335.)

Hillman, C. C. **The Army rehabilitation program for the blind and the deafened.** Jour. Amer. Med. Assoc., 1944, v. 125, June 3, p. 321.

As evaluated by the army, blindness is considered to be present when vision is 20/200 or less in the better eye. The number of cases of blindness in our Army in this war is still small, 73 cases having been recorded by March 1, 1944. Valley Forge General Hospital (Phoenixville, Pennsylvania) and Dibble General Hospital (Menlo Park, California) are the two specially staffed and equipped ophthalmic hospitals which receive all newly blinded casualties. A reporting system to the Surgeon General insures that all cases are found and transferred to these special hospitals for necessary medical and surgical care and initiation of social rehabilitation. Following the necessary hospitalization, a facility for further social rehabilitation of the blind is being set up by the Army to care for their own blind and also those of the Navy and the Marine Corps. The program will provide for social adjustment, teaching of Braille, and prevocational training. A similar program is being prepared for the deafened.

Robert N. Shaffer.

Kirby, D. B. **The American Board of Ophthalmology in relation to prevention of blindness.** Sight-Saving Review, 1943, v. 13, Fall-Winter, p. 174.

The American Board of Ophthalmology has been a stimulus to graduate education and study of ophthalmology, and to the advancement of teaching and research. Although certification by the Board has no legal status the moral suasion incident to being declared safe for practice, diagnosis, and therapy of eye cases has undoubtedly raised the general standard of the spe-

cialty and contributed much to the prevention of blindness.

The relationship of the American Board of Ophthalmology to the American Board of Medical Specialties is explained. Owen C. Dickson.

Mackenzie, Clutha. **Outposts for the blind of Hindustan.** Outlook for the Blind, 1944, v. 38, June, p. 156.

The author describes a journey through India which he undertook in order to study the scattered schools for the blind which take care of twelve hundred out of India's two million blind population. R. Grunfeld.

Maitland, R. F. **A country schoolmaster: Theodore H. Maitland.** Outlook for the Blind, 1944, v. 38, June, p. 163.

The author's father, who had one fourth normal vision, read ordinary print, taught successfully in an elementary school, and later organized a high school and became its principal. R. Grunfeld.

Mumford, E. W. **Nursing care of eye in industry.** Sight-Saving Review, 1943, v. 13, Fall-Winter, p. 165.

Standard procedures for first-aid treatment of eye injuries most commonly seen in industry are discussed from the nursing standpoint. Emphasis is placed on cleanliness and adequate facilities. Limitation of first-aid care is stressed. Use should not be made of various medications such as local anesthetics and fluorescein except on the request of a physician or through his standing order.

Due to the complexity of present visual requirements in various phases of industry, as to depth perception, color perception, convergence requirements, and measurement of accommodation, any nurse who is to assume responsibility needs the guidance of the ophthalmologist. Many of the technical features can be mastered by nurses but interpretation should always be controlled by the eye specialist. Owen C. Dickson.

Pacheco-Luna, R. **Trachoma in Guatemala.** Reprint from proceedings at celebration of 25th anniversary of the foundation of the Association for the Prevention of Blindness in Mexico, 1943, pp. 241-244.

The author recalls some details as to the absence of trachoma in Guatemala, mentioned by him twelve years ago at a meeting of the International League against Trachoma. The only trachomatous persons seen in Guatemala were foreigners, usually Turkish Jews. Such cases have generally been found to progress favorably, have not infected other citizens, and have not spread to native wives or to Guatemala-born children. A similar immunity has been found in other populations. The Guatemala natives live in bad conditions of dirt, poverty, and promiscuity, so that flies and lice are numerous. W. H. Crisp.

Parsons, J. H. **Teaching and research in ophthalmology.** Brit. Med. Jour., 1944, March 25, p. 430.

This paper begins with an exposition of some basic tenets of medical education—the aim of producing a skilled general practitioner, and the corollary features of emphasis on general principles and training in medical logic, as well as reduced emphasis on some of the weight of factual knowledge which the student must assimilate. The ideal arrangement depends on close affiliation between an eye hospital and a general teaching hospital.

"Basic" ophthalmologic research re-

quires extensive training and knowledge in special fields, and is likely to attract physiologists more than clinical ophthalmologists. It is emphasized that a knowledge of clinical ophthalmology is essential for successful research; and research, in turn, will develop most successfully where the individual is given a free hand, rather than by pursuing a planned research program. Benjamin Milder.

Potts, P. C. **Classes for partially-seeing children in schools for the blind.** Outlook for the Blind, 1944, v. 38, June, p. 151.

Most states have classes organized for partially-seeing pupils. Other states have no such facilities. In the latter states many schools for the blind accept children with vision from 20/200 to 20/70. If the number of such children is large enough, it is better to organize special sight-saving classes. If the number is too small they have to be taught together with blind children. Whereas in the regular public school the guiding principle is to let weak-eyed pupils study as much as possible with normal pupils, in the school for the blind the reverse holds true. Pupils with poor sight should work as little as possible with blind pupils. Some pupils will do better by using their sight, while others will do better when they learn by doing rather than by reading. Fullest use should be made of Talking Book, Victrola, radio, slides, pictures, and models. The teacher should have special training in sight-saving methods and eye hygiene, and he should be familiar with the defect and the amount of vision each pupil has. R. Grunfeld.

Rusalem, Herbert. **A blueprint for the higher education of the adult blind.** Outlook for the Blind, 1944, v. 38, June, p. 154.

The author points out the need for adaptation of the existing college-level correspondence-courses to the educational requirements of the sightless. An intermediate agency would have to be created, to provide for Braille transcription of the textbooks and assignments, and to expand Talking Book facilities for those who are unable to read Braille, placing textbook and lesson materials on phonograph records. R. Grunfeld.

Sharp, C. G. K. **Planning for basic research in ophthalmology.** Brit. Med. Jour., 1944, May 20, pp. 697-698.

Looking into the post-war period, the author emphasizes the need for sufficient funds to reduce blindness through research. It is important that this ophthalmic research be organized at this time, and that it be done in close association with the basic sciences, other research units, and clinical facilities. Such research is now being successfully done at the University of Oxford (Ida Mann) and at the Royal College of Surgeons and Royal Eye Hospital (Arnold Sorsby). More such units are needed. £20,000 minimum yearly has been recently appropriated to carry on similar research. It is suggested that those in the services who have outstanding abilities or training in this field be interested in making ophthalmic research their life work after discharge, which it is urged should occur as soon as possible. Charles A. Bahn.

Stallard, H. B. **The eye department in a Middle East general hospital.** Brit. Jour. Ophth., 1944, v. 28, June, pp. 261-275.

A survey of the organization and

nature of the work in the eye department of one of the hospitals serving the Eighth Army from the autumn of 1940 to the conclusion of the North African campaign in May, 1943, is presented. Refractions were the main part of the work both during active military operations and in the intervals.

An average of three sets of full clinical notes and two abstracts was kept for each patient. To this hospital were referred especially patients with retained intraocular foreign bodies, retinal detachments, and cases requiring plastic reconstruction of eyelids, sockets, and orbit, as well as patients of neurologic interest with bizarre field defects. The majority of extractions of intraocular foreign bodies were done by the posterior route. This is regarded by the author as the operation of choice for extracting war missiles. Blind patients awaiting transfer to South Africa were also cared for in the hospital. Often they had to wait three or four months before a hospital ship was available.

The following clinical research was carried out. (1) Penicillin drops were used on infected wounds, in the conjunctival sac and in sockets. Bacteria were found to disappear from cultures of the wound and conjunctiva after 48 hours. (2) Cetyl pyridinium bromide was successfully used in the preparation of the field of operation. Nonirritant to the skin and conjunctiva, it is lethal to staphylococci and streptococci outside the body in 1 in 10 million and in serum in 1 in 10 thousand. (3) The value of sulphonamide dusting in wounds of lids and orbit and in primary suture was studied. (4) New methods in plastic operations were tried with success. (5) A technique of extracting intraocular foreign bodies by the posterior route was elaborated and successfully used in 73 cases. (2 figures, 1 table.)

Edna M. Reynolds.

Sylvester, Lorna. **What the home teachers should know about social work.** Outlook for the Blind, 1944, v. 38, March, p. 68.

The home teacher should respect personal beliefs and behavior however they may differ from those of the teacher. She should also recognize that people grow in self-respect by doing things for themselves, and gain freedom by discovering their own power. Fear of not having this power will often be expressed as an attempt to be dependent upon another. One case history is given to illustrate these doctrines. R. Grunfeld.

Theodore, F. H., Johnson, R. M., Miles, N. E., and Bonser, W. H. **Causes of impaired vision in recently inducted soldiers.** Arch. of Ophth., 1944, v. 31, May, pp. 399-402.

Uncorrectable impaired vision was encountered in 10,532 of 190,012 recently inducted soldiers. This report is the result of a survey taken at Miami Beach, Florida, to discover why the corrected vision of these men was below Army standards (20/40), usually in one eye, or sometimes in both.

It was found that only one fourth of all men with poor vision had organic disease of the eye, In two thirds of the men, trauma resulting from carelessness was the etiologic factor. In the other three fourths, early care of the eyes might have prevented some of the resulting amblyopia, particularly the amblyopia resulting from strabismus and refractive defects.

Questioning revealed that as to almost all of the men with a neglected defect, especially those from large

cities where care was available, the major factor was ignorance or apathy concerning the defect. The authors therefore conclude that education rather than the expansion of existing health facilities is the most essential need. (9 tables.)

R. W. Danielson.

Walker, J. P. S. **Ophthalmic surgeon and optician.** Brit. Med. Jour., 1944, April 22, p. 560.

The author suggests a plan to correlate the efforts of the ophthalmic surgeon, the optician, the orthoptist, and the ophthalmic nurse. He proposes that all these be registered by the British Governmental agencies after reaching competency, and together form groups of different sizes depending on local conditions. The ophthalmic surgeon would direct and would apparently be responsible for the efforts of the others. Thus the sight-testing optician tests eyes under the supervision and responsibility of the ophthalmic surgeon. This plan the author believes would offer ample employment especially after the war, would avoid existing controversies among those now engaged in care of the eyes, and would give the public better eye-service.

Charles A. Bahn.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
904 Carew Tower, Cincinnati 2

News items should reach the editor by the twelfth of the month

Deaths

Dr. Milton C. John, Stuttgart, Arkansas, died June 9, 1944, aged 67 years.

Dr. John R. Pollock, Ardmore, Oklahoma, died June 28, 1944, aged 61 years.

Dr. Wilbut F. Reed, Cheboygan, Michigan, died June 30, 1944, aged 93 years.

Miscellaneous

A postgraduate course in ocular muscles will be given at the Northwestern University Medical School, 303 East Chicago Avenue, Chicago, by Dr. James W. White of New York from December 9th to 16th. Sessions will be held daily from 3 to 6 p.m. and from 7 to 9 p.m.; Sunday from 10 a.m. to 1 p.m. Demonstrations will be held during the day at a convenient time and place for small groups. Registration will be limited. The fee is $100.00—one-half due with registration, balance due December 9th. The committee in charge consists of Drs. S. J. Meyer, T. D. Allen, and B. Cushman (treasurer), 25 East Washington Street, Chicago 2.

Directory of Medical Specialists

The biographic data of the first two editions of the Directory of Medical Specialists included only positions (interneships, residencies, or assistantships) held during the course of training of men up to the time of their certification by the American Boards, and hospital and medical school staff positions then currently held.

It is desired to extend these data in the third edition to include all formal hospital and medical school appointments, with dates held, even though now resigned, as well as records of all military service including commissions and dates, either in World War I, peace-time in the Reserve forces, or in the present war.

Thus, a chronologically complete sketch of a Diplomate's entire career is to be included in this third edition of the Directory.

Membership or fellowship in national or sectional (not local) special societies, and national general societies with offices held, and dates, in any of these, should be reported.

Membership in recognized international medical societies may be included, but honorary or other membership in foreign medical societies should not be reported.

Reference to the second edition (1942) of the Directory may be made for lists of medical societies to be included in one's biographic sketch.

Families or secretaries of men asbsent in military service are asked to complete or correct previous listings or new forms now being mailed to those eligible for inclusion in the Directory. Only those certified by an official American Board can be included, and there is no charge for this listing.

The foregoing notice is published in response to many inquiries, to assist those certified by the American Board who are now engaged in correcting their previous listings, or preparing new sketches for the third edition of the Directory to be published early in 1945.

Communications should be addressed to the Directory of Medical Specialists, 919 North Michigan Avenue, Chicago 11, Illinois.

Societies

The thirty-sixth meeting of the Reading, Pennsylvania, Eye, Ear, Nose, and Throat Society was held September 20, 1944. Dr. Lewis R. Wolf, Temple University, spoke on "The surgical treatment of strabismus" and discussed the means of diagnosis and the indication for operation for the various types of squint.

The Southern Medical Association held its thirty-eighth annual meeting in Saint Louis, Missouri, from November 13th to 16th. Beginning Tuesday afternoon, November 14th, and continuing through Thursday afternoon, the programs of the 20 sections of the association were presented. The officers of the Section on Ophthalmology and Otolaryngology were: Dr. W. Raymond McKenzie, Baltimore, chairman; Dr. J. W. Jervey, Jr., Greenville, South Carolina, chairman-elect; Dr. George J. Taquino, New Orleans, vice-chairman; and Dr. Elbyrne G. Gill, Roanoke, Virginia, secretary.

The Research Study Club of Los Angeles will hold its fourteenth annual Mid-winter Postgraduate Clinical Convention in Ophthalmology and Otolaryngology, January 22 to February 2, 1945.

Provided there are at least 50 applicants the American Board of Ophthalmology will conduct an examination in Los Angeles in January, 1945, just before this mid-winter convention. Application should be made promptly to the American Board of Ophthalmology, Cape Cottage, Maine.

Among the guest speakers will be Dr. Cecil S. O'Brien, Iowa City, Iowa; Dr. Kenneth C. Swan, Portland, Oregon; Dr. William S. Crisp, Denver, Colorado; and Dr. Irving B. Lueck, Rochester, New York.

A special course in "Applied anatomy and cadaver surgery of the head and neck" will be held February 2d to 6th, inclusive. Dr. Simon Jesberg will conduct this course in association with Dr. S. A. Crooks.

The fee for the Clinical Course is $50.00; the fee for the Cadaver Course is $50.00. Please send application and fee to Dr. Pierre Viole, 1930 Wilshire Boulevard, Los Angeles 5, California.

The seventy-ninth annual session of the Michigan State Medical Society was held at the Civic Auditorium and the Pantlind Hotel, Grand Rapids, from September 27th to 29th. Among the speakers at the convention, which was a postgraduate conference on war medicine, was Dr. Albert D. Ruedemann, Cleveland, who discussed "The protruding eye."

Personals

At the luncheon given by this Journal for its directors, staff, and collaborators, on the occasion of the Academy meeting in Chicago, on October 11th, Dr. F. B. Woodruff, as spokesman for the Journal, presented to Dr. William H. Crisp a watch in token of appreciation of his long and loyal service to the Journal. The inscription on the watch reads as follows:

William H. Crisp, for outstanding contributions to ophthalmology, 1944.

After September 21st the offices of Dr. Charles A. Bahn will be located at 1026-1028 Maison Blanche Building, New Orleans 16, Louisiana.

The sixteenth annual Arthur Dean Bevan Lecture was given by Dr. Howard C. Naffziger, professor of surgery, University of California Medical School on October 6th before the Chicago Surgical Society. The title of the lecture was "Exophthalmos and the thyroid: Experiences with major surgery of the orbit."

Dr. A. D. Ruedemann, chief of the ophthalmological department of the Cleveland Clinic, was the guest speaker at the September dinner meeting of the Cleveland Ophthalmological Club. The subject of his lecture was "The value of Beta radiation in lesions of the eye" and was illustrated with many beautiful lantern slides.

The tonometer checking station at the Illinois Eye and Ear Infirmary is making a collection of historic tonometers. Will any reader who has a tonometer that would fit into this collection donate it for display, for which credit will be shown? Any descriptive letters of such tonometers will be appreciated.

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